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November 1984

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80micro

A CWCII PUBLICATION

the magazine for TRS-80* users

T.M.

Utili-Keys

**Unlock the Power
Of Your TRS-80**

**Input Screens
The Easy Way**

**14 New Commands
For Cassette Basic**

**Garbage Collection:
Causes and Cures**

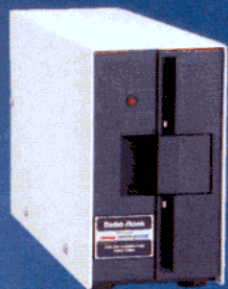
**Editext: A Hybrid
Line/Screen Editor**

**Streamlined Editing
In Model 4 Basic**

**MAD: A Model 4
Address Mapper**



Knock The Socks Off Your

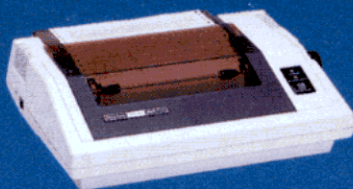


Beef up Your Color Computer with Radio Shack Accessories

Using somebody else's home computer can be a pretty frustrating thing. Tiny memories, second-rate graphics and limited accessories take all the fun out of programming and video games. That's why serious computer hobbyists enjoy Radio Shack's Color Computer so much. No other color computer expands to do so many things.

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High-performance printing from your Color Computer is fast and easy with the DMP-110 dot-matrix printer (#26-1271, \$399.00) from Radio Shack. The DMP-110

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Neighbor's Kiddie Computer



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Choose Radio Shack for Computer Support

The Color Computer and its peripherals are only part of the reason Radio Shack is the choice for serious computer users. Radio Shack offers unmatched support for the Color Computer owner, with exciting accessories like an easy-to-use Color Mouse for video games and color graphics. Video game players have two types of joysticks to choose from, and three memory upgrade kits are available to increase the internal memory of your Color Computer.

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— F.M. Remley, 7/83

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— Tim Daneliuk, 7/11/83

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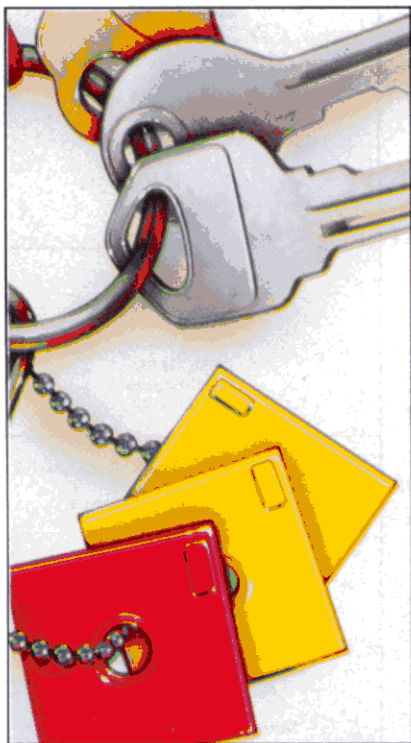
80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of "How to Write for 80 Micro." Payment for accepted articles is made at a rate of approximately \$50 per printed page; all rights are purchased.

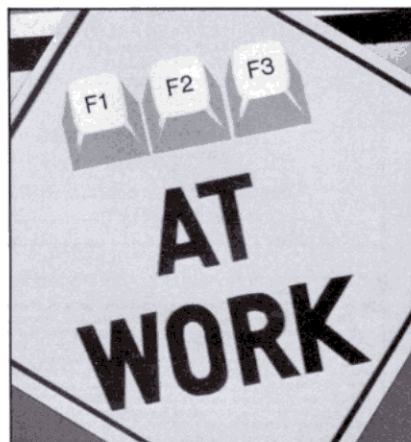
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LOAD 80

Load 80 gathers together selected programs from this issue of *80 Micro* and puts them on a magnetic medium for your convenience. It is available on tape or disk, and runs on the Models I, III, and 4.

If you own a tape system, load the Load 80 tape as per the instructions provided. If you own a Model I or III disk system, boot the Load 80 disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, you must convert the programs from Model III TRSDOS to Model 4 disk using the Model 4 CONV command.

If you have any questions about the programs, call Keith Johnson at 603-924-9471. Yearly subscriptions to Load 80 are \$199.97 for disk, or \$99.97 for cassette. Individual loaders are available on disk for \$21.97 or on cassette for \$11.47, including postage. Direct subscription problems or orders for Load 80 to Lori Eaton, c/o *80 Micro*, 80 Pine St., Peterborough, NH 03458.

Directory

Basic Plus

Article: Basic Plus (p. 44)
System: Model III, 16K RAM
Language: Cassette Basic/Assembly

This Level II Basic enhancement features faster operation and 14 new commands.
Cassette filespec: ONE, TWO

Finder

Article: Basic Changes (p. 56.)
System: Model 4, 64K RAM
Language: Disk Basic/Assembly

The Finder program locates specific strings, edits, moves, or replaces lines, and restores most lines from programs accidentally erased from memory.
Disk filespec: FINDER/SRC (requires EDAS editor/assembler), FND100/BAS, FND/BAS.

Editext

Article: Hybrid Vigor (p. 72)
System: Model III, 32K RAM
Language: Assembly

The Editext text editor lets you enter and correct data before processing it.
Cassette filespec: EDIT
Disk filespec: EDIT/CMD (object code)

Mapper

Article: Finding the Right Address (p. 80)
System: Model 4, 64K RAM
Language: Assembly

An address mapping utility for the Model 4.
Disk filespec: MAD/CMD

Garbage Demo

Article: Quit Stalling (p. 86)

System: Models I and III, 16K RAM Cassette, 32K RAM Disk; Model 4 (Listings 1 and 3 only), 64K RAM

Language: Basic

Eliminate "garbage collection" delays and cut program execution time.

Cassette filespec: B, C, D, E

Disk filespec: GARBDEM1/BAS, GARBDEM2/BAS, GARBDEM3/BAS, GARBDEM4/BAS

Tape Check

Article: Tape Me, I'm Yours (p. 92)

System: Model III, 48K RAM

Language: Assembly

Tape Check verifies source code you record from EDTASM to tape.

Cassette filespec: TPECHK

Create

Article: Screen Writer (p. 98)

System: Models I and III, 32K RAM

Language: Disk Basic

Develop input screens for your Model I or III.

Cassette filespec: F

Disk filespec: CREATE/BAS

Formatter

Article: Easy Input (p. 109)

System: Model III, 16K RAM Cassette, 32K

RAM Disk

Language: Assembly/Basic

A statement that lets you easily define the format for user input in Models I and III Basic programs.

Cassette filespec: INPUT, INPUTB, G

Disk filespec: INPUT/SRC (source code), INPUT/CMD (object code), DEMO/BAS. Source code requires Apparat editor/assembler

LMOFFSET

Article: Tape Transfer (p. 125)

System: Model III

Language: Assembly

An LMOFFSET modification that loads NEWDOS80 EDTASM source files from tape to disk.

Cassette filespec: LMPATC

Disk filespec: LMOFF/SRC (source code). Requires Apparat editor/assembler.

Converter

Article: From EDAS to EDTASM and Back (p. 134)

System: Model III, 32K RAM

Language: Assembly

Load EDAS files with EDTASM.

Cassette filespec: EDTEDS

Disk filespec: EDTEDAS/CMD

Message

Article: BBS Express (p. 152)

System: Model III, 48K RAM (requires 2 drives)

Language: Disk Basic

This month's installment creates message and data-base files.

Cassette filespec: H, I

Disk filespec: LIST1/BAS LIST2/BAS

3KEYS

Article: The Next Step (p. 168)

System: Model 4, 64K RAM

Language: Assembly

A function key filter program for the Model 4.

Disk filespec: FILTER/SRC (object code). Requires EDAS editor/assembler.

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		Model 4 ToolBelt Utilities This holiday special supports all versions of TRSDOS 6.x, including the new TRSDOS 6.2. (See the 4 star review in May '84 <i>80 Micro</i> .)	\$39.95
		LDOS ToolBox Utilities At this sale price, anyone can learn why Sept. '83 <i>80 Micro</i> 's 4 star review says that these programs "perfect this use of LDOS."	\$39.95
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Marketing software is, to put it bluntly, a pain in the south pole.

"We'd love to get out of the software business," said Tandy CEO John Roach at a recent lunch in Boston. After all, he said, Radio Shack makes stereos and tape decks, but leaves the record and tape business to others. Why shouldn't the same strategy apply to their computers?

I can understand why the people in Fort Worth are ambivalent about marketing software. If I were in their shoes, I'd feel the same way. That's where they get most of their bad press and customer complaints. Take CP/M Plus, for example. Radio Shack was excoriated by TRS-80 users for delaying its release by six months, then lambasted for the product's deficiencies. Model III SuperScript received similar treatment.

Customer support makes software retailing an even greater chore. With its large catalog of packages, Tandy has doomed itself to an endless stream of angry phone calls and critical letters. Users find hidden bugs. Disks crash. Computer novices don't understand how programs work. Software turns out to be incompatible with certain hardware configurations. Proofreaders miss errors in documentation. It all adds up to a monumental test of Tandy's resources and good will.

If recent developments are any indication, Roach may get his way. Consider the following:

- Tandy has gone exclusively to third-party developers for its Model 2000 software.
- Tandy has begun to sell third-party software with the original manufacturers' own packaging.
- Tandy is now selling third-party products through its Express Order service, including some that compete with packages Tandy sells under its own name.
- Tandy sponsored five shows in September and October that featured other vendors' software.



These represent an abrupt about-face in Tandy thinking. For the first time, Tandy recognizes the fact that other companies exist in the TRS-80 marketplace.

Some of these companies are skeptical. I've heard apocalyptic stories of software developers who have submitted programs to Radio Shack for review, only to have their work languish forever in a dark drawer somewhere. Many I/III/4 manufacturers weren't invited to the Tandy shows. Others complain that Tandy won't provide them with new computers before official release, thus delaying software development.

The people at Tandy are, apparently, still very selective about the companies they choose to support, and sometimes give support that is barely adequate. This is a big mistake. The slumping TRS-80 market will only be stimulated if all companies, no matter how large they are or what types of products they make, are encouraged and nurtured.

Nevertheless, the signs are that Tandy is moving in the right direction. And while changes in Tandy's software retailing habits may be motivated primarily by self-interest, the results can only be beneficial to manufacturers and users. Third-party developers will have more access to the market,

and users will have a greater variety of products to choose from.

Meanwhile, Tandy will increasingly emphasize hardware development, which is undoubtedly their strength. With Tandy producing quality hardware and support companies contributing quality software, the TRS-80 line's appeal can only improve.

Short Takes

Warning: The arrow keys on the new Model 4 keyboard are arranged in a cluster. If you've got a lot of Model III arcade games that use the arrow keys, be prepared to either toss them in the dumper or grow a couple of fingers in your palm....

Ex-subscribers to Tandy's *TRS-80 Microcomputing News* will be happy to know that *80 Micro* is picking up that magazine's "Bugs, Errors, and Fixes" feature. The column will describe problems with software packages marketed by Tandy.... ■

Wayne Green Reunion

The 25th anniversary of my starting *73 Magazine* is coming up in a few months, so it seems like a good time to throw a small party for Wayne Green alumni. This year's meeting is on Nov. 15 at Comdex in Las Vegas. If you've worked for me during the last 33 years, get in touch. I'm having some special coffee mugs, with the logos of all our magazines, made as souvenirs. Who knows—I may spring for T-shirts next year.

I want every Wayne Green alumni to be there, whether from Wayne Green Inc., Wayne Green Enterprises, or before. As far as I know, with the exception of two people who betrayed me, one of whom is dead and the other completely disappeared from the publishing and computer scene, every alumnus is still a darned good friend.

—Wayne Green

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Our print samples were done on an Epson. Sizes vary on other printers. Some of the samples shown here are taken from the additional Letterset disks.

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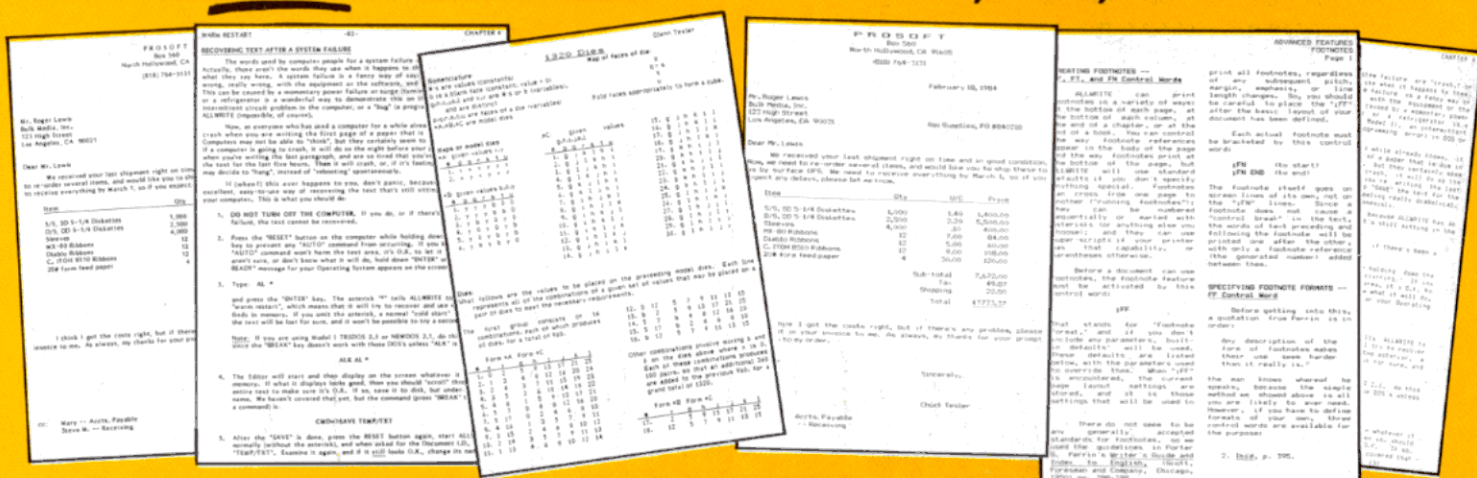
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and then show you where the lost text belongs. This advanced error recovery turns a disaster into a feeling of profound relief.

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ALLWRITE's commands and control keys are easy to remember because they use the first letters of common English words: 'CE' stands for 'Center,' 'Search' and 'Replace' do just that, and so forth. The on-line HELP menu offers over fifty screens of topics.

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To make installation easy, we include Tiny DOSPLUS for the Models I and III, and special, pre-tailored versions of both TRSDOS 6.2 and DOSPLUS IV for the Model 4, all at no extra charge. The Model I and III versions work equally well with all major DOS's.

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"Your company and products have to be one of the strongest factors I can think of for keeping me with the TRS-80!" (J.R.H.)

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"...a very readable manual." (D.S.)

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CP/M Plus

John Harrell, in his review of CP/M Plus (August 1984, p. 31), writes that the program is bug-free. Yet, when you redefine the three function keys with the Setup utility and try to make the changes permanent, the boot track is wiped out.

Leigh L. Klotz
McComb, MS

Mr. Harrell is much too optimistic in his review of CP/M Plus. In theory, CP/M Plus does allow access to a greater variety of software, yet its unusual disk format negates any such advantage. Further complicating the CP/M Plus issue is the lack of multiple-format utilities available.

Another serious defect lies in the fact that the BIOS, the most important source code in any CP/M system, is absent. Had Radio Shack supplied this code, the nonstandard disk format problem wouldn't be so important. To make matters worse, the only usable source code file on the disk is one configured for a different machine!

David Goodwin
Plattsburgh, NY

John Harrell's review of CP/M Plus is misleading. In fact, because of CP/M Plus's many bugs, I seriously doubt the value of this operating system.

CP/M Plus increments all dates entered by 1; for example, if you enter the date as April 14, the system carries the date as April 15. Because of this error, the Date function is useless.

Also, BIOS permits only haphazard functioning of the Caps key, while the type-ahead buffer can handle only one character. Other problems include the keyboard scanner, which is too slow, and the Dump utility, which doesn't give ASCII listings along with the hexadecimal listings.



In addition, this operating system provides less TPA, even in its banked version, than CP/M 2.2. This is frustrating when you consider that CP/M Plus addresses an additional 64K of RAM and it takes three times as long to boot up as CP/M 2.2. In essence, CP/M doesn't work as it should.

Jerry Wagers
Ft. Lewis, WA

Harrell Responds

After some additional research, I agree that CP/M Plus deserves a much lower rating in the "bug-free" category. And there's a serious deficiency in the Setup utility which destroys the boot track on a system disk using the unbanked version of the BIOS. I used only the banked version, and don't consider the unbanked version a viable option for anyone.

The incorrect date is caused by poorly written code. It's supposed to be incremented whenever the system clock counts through 00:00:00. Unfortunately, the boot code interrupts prior to storing the time and allows the date to be incremented. You can repeat the command by typing in DATE MM/DD/YY 00:00:00 at the CP/M Ready prompt.

What is supplied on the disk are those files that need not be changed

from computer to computer. The only two files missing are CHARIO.ASN (the character device driver) and the disk input/output modules. The source code, under most circumstances, isn't included with the system.

If you're familiar with the disk parameter header, the disk parameter block, and the skew table, you don't need these routines. Simply modify these parameters to reconfigure your disk formats.

The type-ahead function works on the principle of scanning the keyboard once during each clock interrupt and storing the character found. It's imperative to disable the clock interrupts while reading the disk so that the operating system won't lose data bytes.

To get the most from CP/M Plus, you'll need Montezuma Micro's CP/M 2.2. The INTERCHG utility reads, writes, and formats the Radio Shack CP/M Plus disk with ease.

Tandy's release of the 700 upgrade should correct the bugs noted by many CP/M Plus users.

John B. Harrell III
Washington, DC

WIBASIC

While Ronald Cangro's review of WIBASIC (July 1984, p. 186) is, for the most part accurate, his using ZBASIC's advertised benchmark results is ill-advised. Advertisements optimize a product's features, so it would have been more instructive to use programs unconnected with either company.

In addition, some of Cangro's statements about ZBASIC are inaccurate. Contrary to what's stated in the review, ZBASIC doesn't include an interpreter; rather, it uses the resident Disk Basic interpreter.

Also, the review cites WIBASIC's incompatibility with Basic, while ZBASIC's compatibility is listed as "limited." WIBASIC wasn't designed

to be directly compatible, yet we've found that it's far easier to port to WIBASIC than to ZBASIC. While Simutek's product supports more Basic key words than WIBASIC, the key words don't perform the same functions as they do in conventional Basic. This, I feel, exaggerates ZBASIC's compatibility with Basic.

*Lou Witt
WittSoft Corporation
Orlando, FL*

NICE Response

NICE, the New Interactive Computing Environment, was first released in 1983. Since then, NICE has been upgraded several times. The second release featured a VisiCalc interface, an enhanced data base, and screen management. The third release, currently in production, provides window capabilities, concatenated keys in data base, a sophisticated search facility, and many other features.

The review in the October 1984 issue of *80 Micro* (p. 39) is either for the first release, or some strange combination of the first and second. For example, the described PF key operation is definitely for the original NICE, which did not support the Model 4, while the instructions for the PF keys mentioned in the review belong to the second release.

The current release does support the Model 4 control key, as well as the three function keys, although the review states otherwise. This discrepancy could be the result of the substantial time that passed since NICE was sent to *80 Micro* for review (about one year).

The reviewer complains that NICE's data-base files are small and useless, the tutorial is very limited, and the help screens are insufficient. What he failed to understand is that NICE is a collection of samples, demonstrating different techniques and presenting ideas as to what you can do with it.

NICE's primary function is to provide a powerful environment that the user can easily customize for his needs. It provides a set of building blocks to build applications: menus, screens, data-base files, reports, forms, and a high-level development language (ICPL).

Since the review was done for an old version of NICE, many of the techni-

*NICE's primary function
is to provide
a powerful environment
that the user can
easily customize.*

cal details and problems mentioned are inaccurate. For example, the PF keys do work correctly, in DOS functions the @ sign isn't converted to ampersand, and the data base does allow full search capability.

In general, however, the technical features and capabilities were not covered at all. There was nothing said about screens and programmable function keys, new techniques for menus, scrolling, the inquiry facility, or the uniqueness of the data base. And nothing was said about the ICPL language.

We agree that the manual could be better. It should be better. We are currently working on a new version that incorporates recommendations from our users.

Earlier versions of NICE did lack a number of features. The data base was not as sophisticated as it is now, screens did not have scrolling or windowing, and the inquiry facility was limited. But we do support our clients. When they have problems, we try to solve them (if possible) and they always have a couple of numbers to call for help.

However, the entire attitude was to show the system as absolutely unusable. Some of the comments were misleading: "(NICE is) presented as being easy to customize" (and not a word whether it is or is not); the inquiry menu "allows retrieval only...in an abbreviated form" (isn't this what the word inquiry means, a quick look at something?); that, compared to Lotus or T/Maker, "NICE falls far short" (Lotus is an integrated spreadsheet, NICE is an integrated environment). We are not familiar with T/Maker, but according to what was mentioned, it, too, is probably an integrated spreadsheet, and also is in a different category from NICE.

Many TRS-80 users are technically capable and creative people who can use the full power of the system. This

review would not give them any useful information on NICE.

*Eugene Schyklar
President
XYZT Computer Dimensions Inc.*

More From Montezuma

In the August 1984 Input column (p. 12), Michael Vournazos expresses dissatisfaction with Montezuma Micro's version of CP/M for not keeping track of line feeds sent to the printer.

This problem existed with older Radio Shack printers that used nonstandard codes. Radio Shack has since standardized its codes, alleviating the problem Vournazos described.

*John Lancione
President, Montezuma Micro
Dallas, TX*

Basic Understanding

I've just finished reading and working through Richard Ramella's *Basic Takes*. The program listings are explained in full detail and are easy to understand.

I'm looking forward to increasing my understanding of Basic with the help of *Basic Takes*.

*Ralph H. Turner
Oberlin, OH*

7-Up

The artist for your August 1984 cover goofed. Dice are always arranged so that the opposite sides add up to seven. His dice add up to seven on adjacent sides.

*J. Bradley Flippin
Arlington, VA*

We know a guy who tells strangers when his socks are inside-out. Must be a buddy of yours.—Eds.

Death of CLOAD

I regret to inform the TRS-80 world in general, and former subscribers of CLOAD magazine specifically, that CLOAD is now defunct.

CLOAD and its assets are now in the hands of the courts. Again, I'm sorry, and thanks to all of you for six years of TRS-80 fellowship.

*Dave Lagerquist
Editor, CLOAD Magazine
Santa Barbara, CA*

Send any questions or problems dealing with any area of TRS-80 microcomputing to Feedback Loop, 80 Micro, 80 Pine St., Peterborough, NH 03458.

Q: I have a Model I with two MPI-2 double-headed drives, LNW doubler, DOSPLUS 3.5, and Gold-Plug 80s. I live in the middle of Manhattan on the eighth floor of an older building. My computer usually functions well, but at certain hours it just goes crazy (reboots, etc.). This seems to happen when traffic is backed up on the street below. The only engineer I know says it's a power line problem. Is this curable? Will I have the same problem with another computer? (Joel Reed, New York, NY)

A: Sounds like a power problem to me, too. If so, an uninterruptible power source (UPS) would definitely solve the problem, as it would supply any additional power needed when the line supply drops below a predetermined level. Power surge and voltage spike protection would also be called for in this case. Unfortunately, most UPS units cost anywhere from \$300 to several thousand dollars.

Another computer might have the same problem, but it depends a great deal on the power supply of the system, and how tolerant it is of power line fluctuations.

Q: I noticed a couple of inaccuracies about Basic in the February Feedback Loop (p. 22). First, the format of an in-memory line of Basic code is: a 2-byte pointer to the next line, a 2-byte hexadecimal (hex) representation of the ASCII line number, the Basic code (which can be up to 255 bytes long, although Basic's input rou-



tine uses a buffer limit of 240 characters), and the line terminator, a zero byte (a carriage return, decimal 13, hex 0D, if the file is stored on disk in ASCII format).

Second, the line of Basic code isn't converted to machine language. Instead, Basic scans the line for a Basic code token, which indicates the location within a ROM table of the address of a corresponding ROM routine. The program branches to that ROM routine and executes it. Basic then returns to the line and continues scanning for tokens until it reaches the end of the line. (Richard Wiley, Honolulu, HI)

A: A poor choice of words on my part—the lines aren't converted, but interpreted as a guide to which ROM routines to use. Thanks for giving us a better description.

Q: Our Naval Base has about 70 TRS-80s with C.Itoh Prowriter 8570 A and Starwriter F10 printers. We've located a firm that sells SuperScript drivers for these printers, but we've been unable to find similar drivers for our Business Graphics Analysis Pak software. Any ideas about where we can buy drivers or

develop our own? (R. Dornick, U.S. Navy, Port Hueneme, CA)

A: I don't know of a supplier; can anyone help?

Q: B.L. of Deerfield, IL (October 1983, p. 333) wanted to use braces to embed typesetting codes with Scripsit. Volume 10 of the *Encyclopedia for the TRS-80* gives a formula for braces in Scripsit. In the lowercase mode, you press the Y and I keys simultaneously and then press the K key to get the left brace; y-i-m gives you the right brace.

Now for my question; when is the proposed book of patches to Scripsit going to be released? (John Barach, Sexsmith, Alberta)

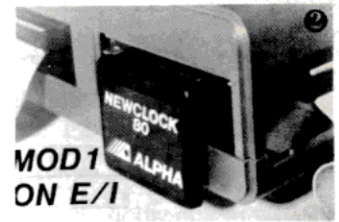
A: "Character Cache" in the April 1984 *80 Micro* (p. 118) provides three-letter combinations for braces and eight other characters. "Scripsit Extras" in the August 1984 issue (p. 68) lists patches for 11 extra characters, including braces. *80 Micro* is no longer planning to publish a book of Scripsit patches.

Q: I have a Model I with a Micro Design 2 System Interface expansion board and a Radio Shack doubler. MULTIDOS is the only double-density DOS I can get to work. I've tried TRSDOS 2.7DD, NEW-DOS80 2.0, and DOSPLUS. Each failed to boot up, giving disk error messages instead. MULTIDOS works fine, but I'm curious about why I'm having trouble with the others. Any ideas or fixes? (M.D. Hall, Montgomery, AL)

A: I'm sure Vernon Hestor (MULTIDOS's author) is glad his DOS works with your system, but I can't tell from your letter why the others don't work as well. Anybody else?

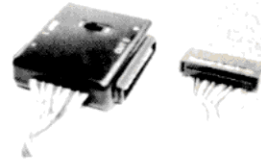
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The right time at the right price! Keep the time and date with quartz accuracy, even when your computer is off. The backup lithium battery (included) will last for over 2 years. Software on tape or disk, please specify. Use "TIMES" once to set the clock. Use "SETCLK" to set your computer's internal clock (at power up) or use "TSTRING" so that the "TIMES" function reads the Newclock. Connection: Model I: plugs into the keyboard or expansion interface. Model III: plugs into the 50-pin I/O bus. Compatible with all operating systems.



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Do you have 2 printers? Get a Printswitch. Stop plugging and unplugging those printer cables. With the Printswitch, you can have 2 printers connected to your computer and you can select either one at the flick of a switch. Works with any printer, plotter, or device that uses the parallel printer port. Simply plug the 14 inch Printswitch cable into your computer, and plug your existing printer cables into the Printswitch. This is the nicest unit on the market. Superior quality board with gold plated edge connectors. For Models I, III, 4 and 4P.



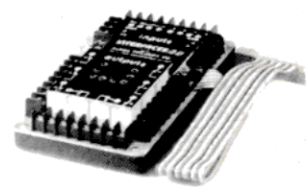
Alpha Joystick \$27.95

When it's time for fun, don't be without your Alpha Joystick. Do you know that most action games are Joystick compatible? Stop pounding on your keyboard and enjoy real arcade control. The joystick can also be used with BASIC programs; simply do J=INP(0) to read the joystick position (8 directions and fire button). Model I: plugs into keyboard or expansion interface. Model III, 4 and 4P: plugs into 50-pin I/O bus. The Alpha Joystick comes fully assembled and tested, ready to plug in and enjoy. (Specify Model I, or Model III, 4).



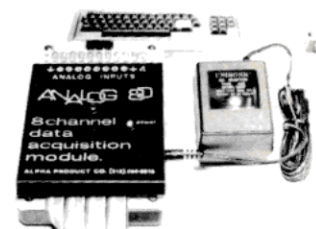
Interfacer-80 \$159.00

Low cost input and output device. The outputs consist of 8 relays (rated 2 Amp @ 125V), easily controlled using "OUT" commands. For example, OUT 0,0 turns all the relays off. Eight LED's show the states of the relays. The 8 inputs are optically isolated, so it's safe and easy to connect external devices (switches, sensors, thermostats, etc.). Simple "INP" commands read the inputs. Connection: Mod I: 40 pin bus. Mod III, 4, 4P: requires 50-pin I/O bus converter (\$39.95) plugs into 50-pin I/O bus. Comes complete with power supply, cable, and detailed manual. (Up to 8 interfacers can be connected to your TRS-80 using our Y- cables).



Analog-80 \$139.00

8 channel 8 bit Analog to Digital converter. Your TRS-80 can read voltages, temperatures, pressures, light levels, etc. • Input range: 0 to 5.1 Volts. • Resolution: 20mV. • Conversion time: 120 microseconds. In BASIC, you can take up to 100 readings per second. • Port address: selectable. Up to 8 Analog-80's can be connected to your TRS-80 for a total of 64 channels! Connection: Model I: 40 pin I/O bus. Model III, 4, 4P: requires 50-pin bus adapter (\$39.95). Comes complete with power supply, cable, and manual.



Special Cables

Disk drive extender cable (8")...C160:\$9.95

Y-Cable for Mod I bus (40 pin): • X2-40...\$29 • X3-40...\$44 • X4...\$59 • X5...\$74

Y-Cable for Mod 3 & 4 bus (50-pin): • X2-50...\$34 • X3-50...\$49 • X4-50...\$64

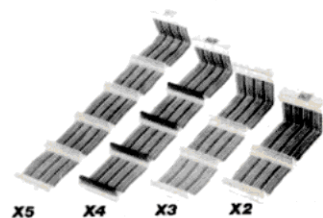
Disk drive cable (34 pin): • 2-drive...C162:\$32 • 4-drive...C163:\$45

Extension cable, 4 foot: • For printer and drive (34-pin)...C165:\$22

• For Mod I bus (40-pin)...C167:\$24 • For Mod 3 & 4 bus (50-pin)...C169:\$28

Keyboard to E/I (40-pin, 8")...C161:\$21 If this is confusing, send for our Cable Flyer.

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Q: I own a 48K dual-disk drive Model III, and I use Scripsit quite a bit. I recently purchased a Holmes Engineering VID-80 128K CP/M modification board—mostly for its 80-character by 24-line screen format. However, Scripsit won't load. Also, I find most of the commands using the break key as the control key don't work (reverse video, for one). The manual says to contact Holmes by letter, not by phone. I've written two letters asking for help and I haven't received an answer yet. Do you know of any patches to make Scripsit work with the VID-80? (Charles Donsi, Riviera, AZ)

A: Unfortunately, the VID-80 board won't work with Scripsit or any program that directly addresses the Model III video memory rather than using the device control blocks (DCBs) that point to the video driver routines. When you boot up your system, the VID-80 board copies the Model III ROMs to its on-board RAM and modifies the video routines. So any program that directly addresses the Model III video memory bypasses the changed code that the VID-80 board uses and goes to the wrong memory locations.

The 80-character by 24-line display is restricted to the CP/M operating system, to Basic programs that don't use POKes to put data on the video, and machine-language programs that honor the Model III DCBs. I don't know of any patches to Scripsit to make it work with the VID-80 board.

I, too, have been having difficulty communicating with Holmes. I'd suggest calling them and talking with a technician. But be forewarned—the technicians are busy, so you might not be able to get through to one on your first call.

Q: I use a 16K Model 100 on business trips as a portable typewriter to record notes for transmission to my office. I tried using my high-quality microcassette recorder, an Aiwa TP-M7, to save a text that's too long to fit into memory. However, the transfer back and forth doesn't work reliably. Is there a way to modify the recorder for use as a data-storage device? A Model 100/microcassette combination would be the perfect answer to some of the more expensive units I've

seen on the market with built-in recorders. (Gordon Kane, Southfield, MI)

A: The problem is that the output of the Model 100 is designed to plug into the AUX input of a cassette recorder, not the MIC input. The microphone input is much more sensitive, so the Model 100 overloads the recorder's circuitry, distorting the signal to the point that the Model 100 can't read it when you try to reload the data.

Also, you need a motor remote-control jack on the recorder; otherwise, you'll have problems reloading the files (the computer turns off the cassette player after each block of data so it can position and code the data). Unfortunately, microcassettes with an AUX jack don't have a motor control jack and vice versa.

You need to construct a patch cord between the computer and the microcassette's MIC input that reduces the Model 100's output to a level compatible with the recorder. To do so, get a mini-jack (input) and a mini-plug (output) connector. You'll also need a 1/2-watt 3.3k resistor, a .01 microfarad capacitor, and a 100-ohm resistor. Solder the 3.3k resistor and the capacitor in a series to the center pins of the two connectors. Next, solder the 100-ohm resistor from the center pin to the outside pin of one of the connectors, then solder the outside pin connectors together.

This signal attenuator should reduce the AUX level of your 100 to the MIC level of the microcassette. If the attenuator reduces the signal too much, lower the value of the 100-ohm resistor. 100 ohms seems to work well with Olympus recorders, while Sonys require an 11-ohm resistor. If you're really good with electronics tools, you could assemble the three components in your Model 100's cassette DIN plug, but then you couldn't use that cord with standard-sized tape recorders in their AUX jack.

Q: I'm having trouble converting programs from the Model III to the Model 4. I have a number of programs that use CMD"O" to initiate a high-speed sort. This logic apparently doesn't exist in the Model 4. Is there a commercial program I can call from Basic on the Model 4, or a

good sort in Basic I? (Howard Feldman, Three Bridges, NJ)

A: I'm afraid you're right—Model 4 Basic has no built-in sort routine. But there's hope. The July 1980 issue of Tandy's *TRS-80 Microcomputer News* has a machine-language sort routine that works on the Models I, II, III, and 4, using the VARPTR routine. It's very fast, on the order of a second or so for 300 records. The only problem is that the sort is restricted to single-dimensioned arrays. The November 1981 issue of the same publication has an updated routine that you can use with multi-dimensioned arrays.

You can buy back issues from your local Radio Shack as bound volumes for \$4.95 for 1980 (catalog number 26-2115) or \$9.95 for 1981 (catalog number 26-2240). Hope this helps.

Q: I own an LNW80-2 computer with two 5 1/4-inch double-sided disk drives, one 5 1/4-inch single-sided floppy drive, and an 8-inch single-sided double-density drive. Using NEW-DOS80, CP/M, and my Power program, I can read almost any disk. But being able to read a disk doesn't necessarily mean I can understand it, and I'm stumped.

I just inherited a Digital Research word processing system on 8-inch disks. The program is about 10 years old, and is on a 77-track, 36-sectors-per-track, 128-bytes-per-sector disk. This much I've figured out, but reading the disk with my Power program gives me nothing that's intelligible. Do you know of a conversion program? (R. W. Torell, Riviera, AZ)

A: First you need to know what operating system the word processor uses. If it's 10 years old, it certainly isn't CP/M, which wasn't released until about 1976, or NEWDOS-80, released even later. My advice is that you contact Digital Research and ask for information about the program. Can anyone help?

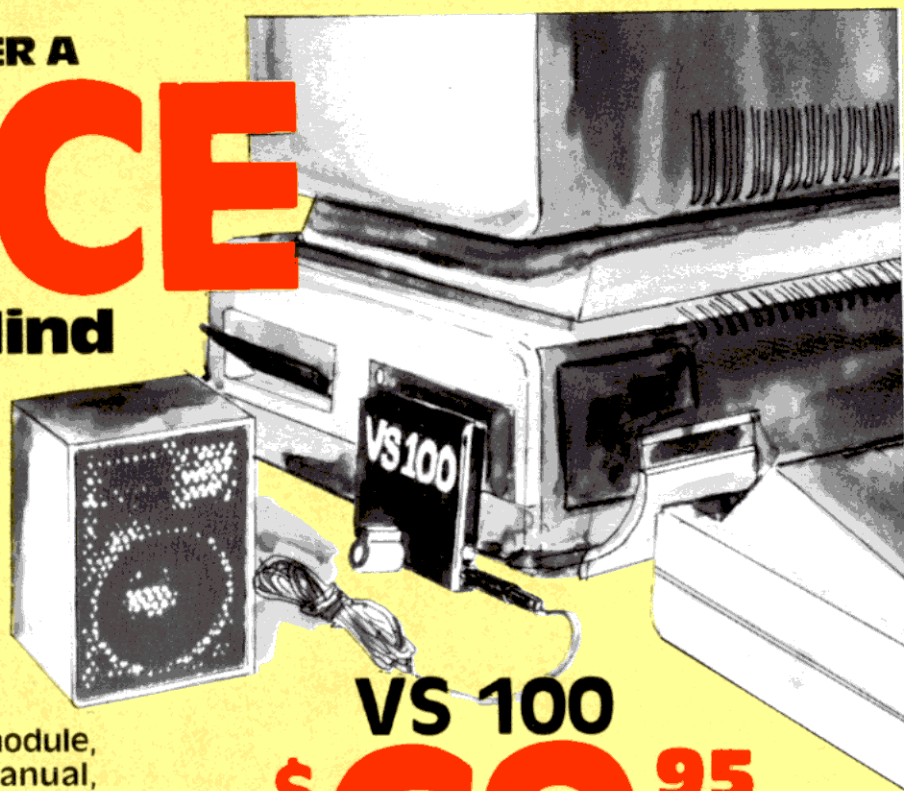
Q: I have a Model I with two 40-track drives. Do you know of any patches to convert MULTIDOS, DOSPLUS 3.5, and TRSDOS 2.8DD from 35-/40-track to 80-track systems? I tried the Model III patches

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and they didn't seem to work. (Albert Landgrebe, Beltsville, MD)

A: Because of hardware differences between the Models I and III, patches to the DOSes of one won't work on the other. As I recall, MULTIDOS will format an 80-track disk (if you have an 80-track drive) and then let you use the Backup command to move the DOS to the new disk. You can format an 80-track disk with DOSPLUS 3.5, but you can't use Backup to move the DOS—Backup reformats the disk to match the source disk. Contact the DOSPLUS people for details on exchanging disks or buying an 80-track version.

To the best of my knowledge, no one has yet developed or released patches for operating TRSDOS 2.8DD on 80-track drives. If you just want 80-track support, you don't have to change the DOSes; use the CONFIG or SYSGEN commands to define a drive as 80-track (see your manuals).

However, 80-track disks won't do you much good if you have 40-track drives. The drives step out only as far as they're designed to, then stop.

Q: I'd like some help transferring Basic programs from a Model III (single-sided double-density disk drive) to a Model I (single-sided single-density). As you know, Model III TRSDOS lets you convert a program from Model I format to Model III, but I want to go the opposite way.

I tried using a cassette tape at the low baud rate, but the best I can get is a 50 percent success rate. The time spent debugging makes this unworkable. I've been told that alternate operating systems such as DOSPLUS and NEWDOS have utilities that make the conversion, but I'd prefer not to buy a new DOS. (John Malbon, Swan Marsh, Vic., Australia)

A: What you need is Super Utility Plus; it'll let you transfer a program from any DOS format to any other DOS format. The only restrictions are hardware (i.e., it can't copy a double-density disk if your hardware is all single-density) and CP/M, which has too many formats. SU+ performs a host of other functions; it's sold by Powersoft Products, 11500 Stemmons Freeway, Suite 125, Dallas, TX 75229, 214-484-2976. It retails for \$79.95 for

```

Line 140 Delete one GOSUB 14
Line 9010 Change :W3=W2*WY=W* to
:W3=W2:WY=W2:
Line 9011 Change :W3=W3*W2:W2: to
:W3=W3*W2*W2:
Line 9031 Change :IFY<W1 THEN 9031 to
:IFY<W1 THEN 9031
Line 9042 Change :WA=WA-W3/I=-1 to
:WA=WA-W3/I=-1
Line 9050 Change W4=.5:I=3: to
W4=.5:W5=W4:I=3:
Line 9051 Change :W4*I/(I+1): to
:W5=W5*I/(I+1):

```

Program Listing. Corrections to double-precision routines.

the Model I, III, or 4 version, with \$10 airmail handling charge for foreign shipping. Make sure you order the Model III version.

Q: You printed a letter from me (July 1984, p. 16) stating that I couldn't load Adventure International's Sea Dragon on a Model 4 and that Copycat 2.0 didn't correct the problem for me.

Since sending the letter, I have solved the problem. It wasn't that Copycat won't duplicate Sea Dragon; it definitely does. Rather, the game disk itself was somehow flawed. (Jim Basile, Cliffside Park, NJ)

A: Thanks for the progress report, but your Model I Sea Dragon isn't flawed; it wasn't designed to operate on a Model III or Model 4. The Model III version does work on the Model 4 in Model III mode, as I said in the July column.

Q: Here's a list of corrections (see the Program Listing) to Jim King's double-precision routines, published in the March 1984 Feedback Loop (p. 16); lines 9030-9051 appear in the July 1984 Reader Exchange (p. 36). (Harry Hawkins, Burton, SC)

A: Thanks for the corrections.

Q: Our chemical manufacturing operation uses a variety of Radio Shack computers and peripherals. Recently, we happened to combine a Qume Sprint 5 daisy-wheel printer with a Model II and a hard disk running under TRSDOS 4.2.6. We're getting intermittent printer interruption

errors; the printer stops in the middle of a job and the computer reports spurious "printer out of paper" or "printer not on line" messages. We've used the same equipment in different configurations without problems.

We found no problem with the hardware, and the people at Fort Worth's Operating System and Language Support section say they don't think it's software. How can we correct the problem? (Richard Levesque, Fall River, MA)

A: It's possible that the Qume puts an unusual load on the printer port, which normally isn't used. Similarly, the hard disk could be putting an unusual load on the computer expansion port. With both pieces of equipment operating, this could create a conflict that could result in the problems you're having.

I ran into a similar problem with a Datasouth printer on a Model II. It worked fine for several weeks, then it would malfunction. Switching it to another Model II solved the problem for a few weeks, then it would happen again. Unfortunately, there isn't a nice, pat solution. The cause could be anything from a slightly marginal transistor in the printer, computer, or hard disk to an incipient circuit board failure triggered by the particular hardware configuration. At times, I've felt you could blame problems like these on the side of the bed you slept on or the color of your hair. ■

Terry Kepner is a freelance writer and programmer. He's been writing about microcomputers since 1979.

Frequently Needed Numbers

Radio Shack National Parts Division, 900 E. Northside Drive, Fort Worth, TX 76102, 817-870-5662. M/C and Visa accepted; each order has \$1.50 handling charge.

IJG Inc., 1953 W. 11th St., Upland, CA 91786, 714-946-5805. Publisher of *TRS-80 Disk and Other Mysteries* (\$22.50), *Microsoft Basic Decoded and Other Mysteries* (\$29.95), *The Custom TRS-80 and Other Mysteries* (\$29.95), *Machine-language Disk I/O and Other Mysteries (Model I)* (\$29.95), *How to do it on the TRS-80* (\$29.95), and the *Electric Pencil Word Processor* (\$89.95).

Welcome to the second issue of *In Touch*. This month, let's answer some common questions about the VS-100 voice synthesizer.

In Touch

The Alpha Newsletter

■ How good is the voice?

We think it's incredible for the price, but you can judge for yourself by calling our 24 hour Demo Line: (212) 296-0399.

■ What does it take to make my BASIC programs talk?

With *TALKER 1.4*, it's simple. With *TALKER 2.0*, it's incredibly easy. If you add an asterisk after a "PRINT" command, the PRINT now speaks. (e.g. PRINT★ "Hello Judy" will speak, not print). If you add an exclamation point instead of an asterisk, the PRINT command will print as usual, and in addition, it will speak! To add speech to your favorite BASIC program simply sprinkle a few "★" and "!" where you want speech. Could it be any easier?

■ Is it compatible with my DOS?

The software and hardware do not rely on any DOS feature, therefore the VS-100 system works with any Model I or III DOS.

■ Do I need any cables?

No, the VS-100 plugs directly into your TRS-80. It uses the expansion port on your computer, so it doesn't interfere with any printer, disk drive, or RS232 device. On the Model 4P, the card edge is recessed; be sure to order the special 50-pin extender cable

■ Do I need an amplifier?

No, the amplifier with volume control is built into the VS-100. All you need is a small speaker; we recommend our handsome mini-speaker (\$5.95).

■ Which port does it use?

All communication between the computer and the VS-100 is done using port 11.

■ Can I purchase the user manual alone?

Yes, it is available for \$5 plus \$1 shipping and handling. (The \$5 is applicable towards purchase of the VS-100).

■ How many words can the VS-100 say?

There are two ways to make speech synthesizers. One is to use a limited look-up dictionary. The VS-100, on the other hand, uses a much more powerful approach: the "text to speech" automatic translator. This means that any word will be pronounced. The text to speech translator, with its 400 pronunciation rules, achieves a 96% success rate.

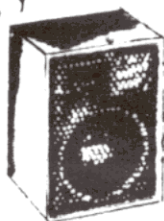
■ Can I get speech automatically, without doing any programming at all?

Yes, *Talker 2.0* has very powerful "automatic keyboard echo" and "screen echo" options. Everything that is typed and/or printed on the screen can also be spoken.

We would like to thank all our customers for the very nice feedback that we receive. (Such as the letter at right).



What is your reason for keeping your TRS-80 mute?



17

To Alpha Products, 79-04 Jamaica Ave., Woodhaven, NY 11421

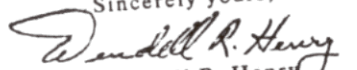
Gentlemen:

I seldom write manufacturers of Computer products. However, I am so pleased with my purchase of the VS-100 Voice synthesizer, I felt I must let you know it.

The unit performs EXACTLY as advertised. The documentation furnished is clear, understandable and straightforward. The disk software seems absolutely flawless in use.

The VS-100 is simple to program and flexible enough in programming to accomplish exactly what I wish. I have incorporated it into all my computer tutorials. Congratulations on your product!

Sincerely yours,


Wendell R. Henry

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You don't need any previous programming experience since The Producer writes all the code for you. And when the program is finished, it runs by itself without the support of the original operating system run disk.

What Kind of Programs Can The Producer Write?

With the Producer you can create impressive, sophisticated and functional software to manage your data. The only limit is your imagination. You can quickly and easily create programs to manage such things as mail lists, personnel records, inventory control, library catalogs, loan calculations, personal finances, and maintenance schedules.

You may never again need to buy a canned program to perform a needed task related to data storage and retrieval. The Producer can write all those programs for you, including the capacity to do all standard calculations and to generate both on-screen and printed reports. The freeform report generator even allows you to design reports on your preprinted forms.

How Does The Producer Work?

The Producer itself is a sophisticated program based on years of research and development. But The Producer was written with the end user in mind and the program generation process is quite simple.

You can begin by using a planning form designed to help you organize your program ideas. The Producer then asks you a series of simple English questions to enable those ideas to be translated into a program format. You use the computer's arrow keys and graphic characters to draw the data entry screen just the way you want it.

Then with the press of a button, the program generator takes over and does all that complex coding for you in a matter of minutes. The result is a complete program, capable of running by itself. That means your customized programs may be used independently of The Producer. (A feature not possible with Data Base creations.) You may duplicate your Producer generated programs and even sell them for others to use, without paying royalties.

How Difficult Is The Producer Process to Learn?

The Producer software package makes learning simple. An easy to follow tutorial takes you through each step of The Producer process as you sit at the computer. (This includes audio cassette tapes with the Model I/III versions.) This hands-on experience not only teaches you the process but allows you to create a program of your own design while you learn. The tutorial is all you need to get started.

Later, if you have need for more specific information, you can turn to the fully indexed Producer Reference Manual. The 200 pages of documentation cover virtually any question you may have so you will never be left guessing what to do next. The Producer package also includes a quick reference card to streamline your program operation and, should you ever need technical assistance, you may call a Producer Software technician for free counsel and trouble shooting.

Is It True That I Can Both Create and Edit At Will With The Producer?

Yes! Unlike most other program generators, The Producer gives you complete freedom to design the screen any way you wish. Experiment, rearrange, "cut and paste" between trial screens. That's the kind of versatility you get. And even after your program is complete, you can change your mind. With The Producer you can edit and refine finished programs without starting over. That's a real time saving.

What Are Some Other Outstanding Features Of The Producer?

- Our B-Tree file structure gives extremely fast access to data, allows global search and replace, data entry by batch mode and automatic file rebuilding.
- The Screen Generator is the best anywhere at any price and gives full screen control including graphics. You can add, insert, or delete, and move blocks of text on screen and between screens.
- All math calculations are supported including subtotals and global recalculations.
- The Freeform Report Generator gives you an amazing versatility to design text placement, interfield calculations, and formats. You can even print reports on your standard forms.
- The Producer package also includes a free Home Inventory program and a one year subscription to The Producer Newsletter.

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That Extra Something: CP/M for the Model 100

Hot Items

Behind the scenes at this year's National Computer Conference in Las Vegas, representatives of PIC Inc. showed a Model 100 running CP/M with 64K of RAM and a battery powered 360K disk drive. The add-on memory module, developed by the Irvine, CA-based firm, should be available in late fall, according to a company spokesman.

The battery-powered add-on system PIC was showing incorporated 32K of high-speed 8K by 8-bit CMOS RAM on a separate card. The expansion RAM card resides within a 3¼-inch Dysan-formatted Tabor disk drive.

"Although there are questions as to whether or not the 360K, 3¼-inch disk format will catch on," PIC's president Ken Harlin said, "we were attracted to Dysan's concept of marketing [its drives]." Harlin also noted that PIC could make its system available on other disk formats (5¼- or 3½-inch) if Dysan's smaller drives weren't acceptable to consumers.

At show time, PIC was still negotiating with Digital Research Inc. to license CP/M 2.2 for the Model 100. PIC's add-on expansion unit will run CP/M with a minimum 48K RAM (16K on board the Model 100 and 32K on the expansion unit). But Harlin told *80 Micro* that nothing was firm.

Prices for the add-on, CP/M, or combinations of the drive with CP/M weren't established at the time of the show, according to Harlin. One factor is an expected price reduction for CMOS RAM chips (from \$17-\$22 each in quantity).

edited by Bradford N. Dixon

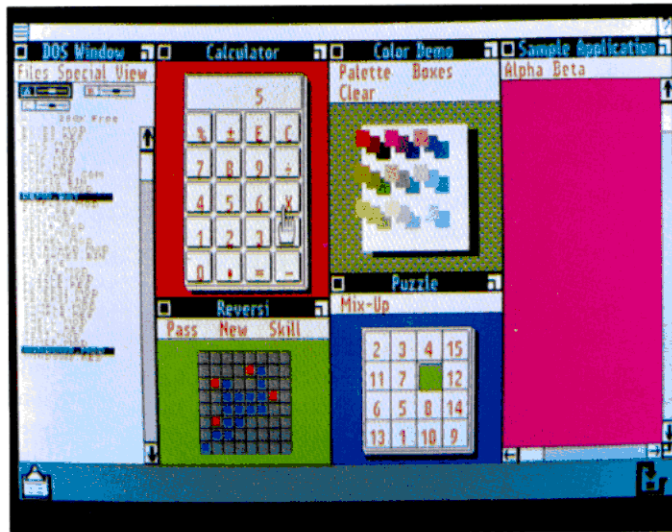


Photo 1. Microsoft's MS-Windows for the Model 2000.

Will Microsoft Windows make Tandy's Model 2000 more attractive to software developers? The jury's still out.

As an extension of the MS-DOS operating system on the 2000, Windows provides a "universal operating environment for the development of rich, graphics-based applications programs" according to the people at Microsoft (see Photo 1).

Supposedly, Windows' appeal is founded on more than the 2000's color and high-resolution capabilities. Mouse-based programs developed using Windows will run on any computer that provides the Windows environment.

Software companies such as Multi-mate International, Peachtree Software, and Microrim are considering products that use MS-Windows. However, none of these manufacturers has definite plans or a timetable for possible release of a Windows-based product.

Microsoft is aiming to have Windows-based word processing, via Mi-

crosoft Word, ready early in 1985. Their Multiplan spreadsheet may be out in a Windows-based version in time for Comdex in November.

And Tandy isn't the only computer manufacturer expected to support Microsoft's program. Digital Equipment, Texas Instruments, AT & T, Wang, Zenith, and Hewlett-Packard have all voiced their intentions to make Microsoft Windows available for their micros.

Tandyland

If you've noticed Tandy's newspaper ads for the Model 2000 lately, you al-

so might have noticed a new logo identifying the 2000 as a member of Tandy's Advanced Technology Series.

In July, Tandy began using the special logo to designate an elite group of products that "utilize the very latest leading-edge technology," according to Tandy's chairman John V. Roach. Roach underlined the special character of these products saying, "Less than one percent of our products will be awarded this distinction initially."

Radio Shack's Model 100 joined the Tandy 2000 in gaining the Advanced Technology distinction as did a new digital audio disk and a 16-channel portable programmable scanner. As other state-of-the-art products appear in Radio Shack stores, those that meet the Advanced Technology Series standards will be awarded the emblem.

Update

Quality Education Data, a Denver research firm that studies micros in education, recently released some specific information about the most popular

micros used in education. The numbers jibe with percentages reported in the September 1984 Pulse Train (p. 21), but QED's latest report provides some hard numbers.

The list of the country's 59 largest school districts using microcomputers shows that Apple computers remain the most popular, with 16,992 units, while Radio Shack comes in second with 10,448 installed computers. The Table lists the top 10 districts using Radio Shack computers.

The lap-size portable computer market narrowed even further last July when Convergent Technologies announced suspended production of its Workslate portable computer.

It appears the end is near for Workslate, one of the Model 100's first competitors. Although the company will still sell the computer from inventory, marketing is minimal and the company has moved most of the Workslate employees to other jobs.

How do you spell "lawsuit"? Cornucopia Software Inc. of Berkeley, CA, which sells the Electric Webster spelling-checker program, knows better than most. This past spring Merriam-Webster Inc. slapped Cornucopia with a lawsuit aimed at blocking the sale of Electric Webster.

Merriam-Webster, based in Springfield, MA, alleged that Electric Webster's packaging imitated the "trade dress" of Merriam's best-selling *Webster's Ninth New Collegiate Dictionary*. Merriam also claimed that Cornucopia infringed on their bullseye trademark, including the Webster name.

In addition to an injunction, Merriam sought triple damages from Cornucopia, an accounting of the defendant's profits, and \$500,000 in punitive damages.

Last July, Cornucopia's Philip Mantsfield said that the matter was settled out of court for an unspecified amount of money. In addition to paying the settlement, Cornucopia agreed to state in Electric Webster advertisements that the program and Cornucopia weren't associated with the Merriam-Webster dictionaries.

Face to Face

Over the course of the summer there was lots of movement between offices

School District	Radio Shack Computers
Duval County, FL	1662
New York, NY	1331
Dallas Independent S.D., TX	1200
Los Angeles Unified S.D., CA	740
Chicago P.S.D., IL	729
Polk County S.D., FL	572
San Antonio S.D., TX	500
Orange County S.D., FL	425
Palm Beach County S.D., FL	360
Houston Independent S.D., TX	280

Table. Top 10 school districts using Radio Shack computers.

at the Tandy Towers in Ft. Worth. Bill Walters left his position as the product line manager for Radio Shack's lap-size Model 100 and was replaced by Stewart Weinstock. Weinstock was with Tandy in Philadelphia before taking the Model 100 position. He moved up through the ranks, holding positions as Radio Shack store manager, computer marketing representative, and senior marketing representative. Although Weinstock doesn't have a technical background, his marketing experience should help him anticipate computer buyers' needs.

When Ed Juge was promoted to director of market planning from director of merchandising for Radio Shack's business computer products, the door was open for Van Chandler

to move into Juge's old job. Chandler was Radio Shack's first software expert and handled software development for the Model I. His most recent title was Radio Shack's director of applications software.

All the activity culminated with the appointment of Bernard Appel as president of the Radio Shack Division of Tandy Corporation (see Photo 2). Appel started with Tandy as a buyer, and has served as a merchandise manager as well as in various positions as vice president. Most recently, he was Radio Shack's executive VP of marketing.

MicroTrends

The feds are taking steps to bring the criminal code into the computer age. Recently the U.S. House of Representatives approved the first federal criminal law against unauthorized computer access. The bill makes it a felony to obtain classified computerized information without authorization. The proposed law also makes it a felony to receive more than \$5,000 in profit in one year as a result of a computer break-in.

The maximum penalty for first offenders would be 10 years in prison and a \$10,000 fine, or twice the value of the offender's illegal gain, whichever is greater. Twenty years in prison and \$100,000 or twice the illegal gain, whichever is greater, is the proposed penalty for repeat offenders.

Under the bill, computer tampering is a misdemeanor punishable by a \$5,000 fine or one year in prison. Computers holding financial and credit data are also covered under the bill's umbrella when that data may be accessed only by a government computer.

In light of the recent hoopla involving illegal entry to a variety of government and private computer systems, it seems Uncle Sam is serious about cracking down on computer-related crime.

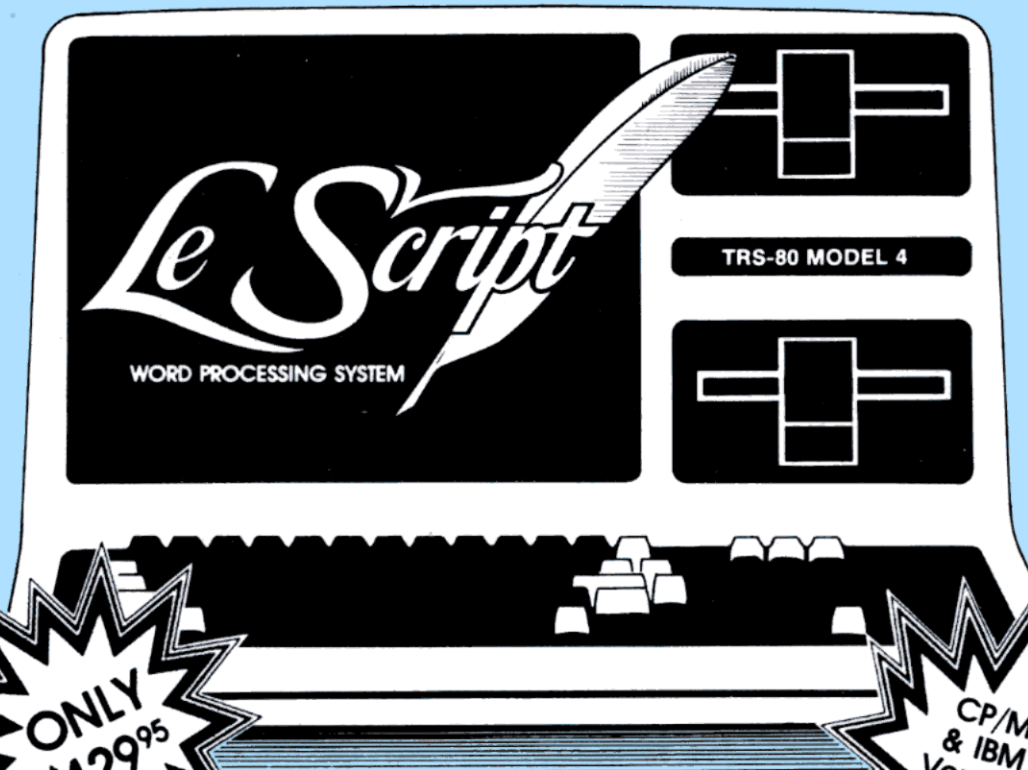
It was probably inevitable in 1984: Business managers are using personal computers to handle personnel problems.

According to an article in the July 25, 1984, *Wall Street Journal*, managers are turning to floppy "doctors" for everything from a solution to production slumps to entire personnel



Photo 2. Bernard Appel, new president of Tandy's Radio Shack Division.

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training programs. Software ranges from simple computerized management training programs to more sophisticated programs that actually provide advice based on an employee's psychological profile.

Although programs from companies such as Human Edge Software Corp. of Palo Alto and Interactive Health Systems Corp. of Los Angeles have found some support in the business arena, there are also skeptics. Derwin Fox, vice president of Xerox Learning Systems, was quoted in the article as saying, "I don't think you can substitute interaction with a computer screen for interaction with another person in learning to deal with people."

Nonetheless, a study conducted by Wilson Learning Corp. indicates that in the next five years, half the money spent on management training in U.S. business will go toward computer self-instruction courses. The trend indicates a 45 percent increase over the current \$1 billion spent annually in management training.

Strangely enough, the office isn't the only place where people use these programs. When one Human Edge customer introduced the software product called Management Edge to his wife, she immediately adapted it for handling their "stubborn" three-year-old son. The article went on to indicate that the woman's friends were interested in using the program to get advice on handling their husbands.

In the future, perhaps police departments will use similar programs to handle domestic disputes. School counselors could tap the power of micros to combat student problems. Ah, Big Brother, the possibilities seem endless. If only micros could be built with warm handshakes and sympathetic CRTs....

A Newsweek market research report found microcomputers gaining support in businesses that have more than 5,000 employees.

Among micros available to business professionals, IBM PCs were preferred, followed by micros in the Apple II family, Wang's Professional, Radio Shack TRS-80s, and Digital Equipment's DECMate and DEC Rainbow. The report didn't specify which model in the TRS-80 line was most popular.

The businesses surveyed used micros primarily for word processing, accounting, financial analysis and planning, data-base management, data input and analysis, education and training, and communications. Use of micros for electronic mail and graphic design and production was expected to grow, but in most of the companies, in-house networking was barely underway.

Not all the competition during last summer's Olympic games involved athletes. Lotus Development Corp. of Cambridge, MA, and Ashton-Tate Inc. of Culver City, CA, waged their own contest in the commercials between ABC's television coverage of the games.

The commercials featured Lotus' integrated software program Symphony, and Ashton-Tate's Framework. Both companies feel the time is right for mass media advertising and both have the bucks to do it. The spots, at \$260,000 for each 30-second airing, are testimony to both companies' belief that the software battle will be won in marketing, not product features.

Last summer, Searchmart Corp. of North Palm Beach, FL, introduced a free call-in software-products data base called (uniquely enough) Software Library, which they feel is revolutionary.

"There are several software data bases," states Victor Gruneau, president of Searchmart, "but they charge substantial fees for making searches and they are not available on-line to software shoppers who want to search the files at their convenience on home or office computers." Callers can get descriptions, prices, and other details about thousands of software packages.

Most of the information of interest to TRS-80 owners concerns business applications software. A search for accounting programs using CP/M for TRS-80s turned up descriptions of over 25 packages in a wide range of prices. However, the data base had no listings describing games available in Radio Shack's TRSDOS format.

The phone number for the Software Library's computer is 305-845-6466 and you should set UART parameters for 8-bit words, 1 stop bit, and no parity. The host computer responds nicely

to 300 baud transmission and may also support 1,200 baud.

Now that Radio Shack Computer and Telephone Centers are sharing retail space, the possibility arises that the two technologies might merge as well. It seems only natural.

Although hardware that joins telephones and computers has been around since 1981, the introduction of Zaisan Inc.'s IBM PC-compatible ES.3 computer-phone in August drew new attention to the concept. Articles describing the Houston firm's \$2,595 hybrid appeared in *PC Week* and *Business Week*.

Even with Radio Shack's new emphasis on the telephone, there's been no hint that the firm might get its computers and its phones together. In light of the telecommunications boom, however, it might be something for the folks in Fort Worth to think about.

A recently published study looks at computer education in New York City's public schools, with special attention to the economically disadvantaged minority student. The Community Service Society of New York (CSS) commissioned the study, titled *Computers in the Schools: The New Frontier*. To make sure that poorer kids aren't left out of the computer revolution, the report calls for close monitoring of money spent on computer education.

The study looks at how computers affect poor children's ability to learn and to find good jobs after graduation. It also considers what schools can do to help families that can't afford a home computer. For a copy of the report, write to Adrienne Hiddelson, Community Service Society of New York, 105 E. 22nd St., New York, NY 10010.

How much time and money does it take to run a public-access bulletin board system? That's what *Plumb*, the BBS newsletter, asked sysops in a recent survey. As it turns out, sysops spend 50 hours a month maintaining their message and data bases and modifying their boards. Start-up costs average more than \$3,000, and it takes \$50 a month to maintain the system. Monthly expenses include costs for electricity, telephone service, equipment, supplies, and legal advice. ■

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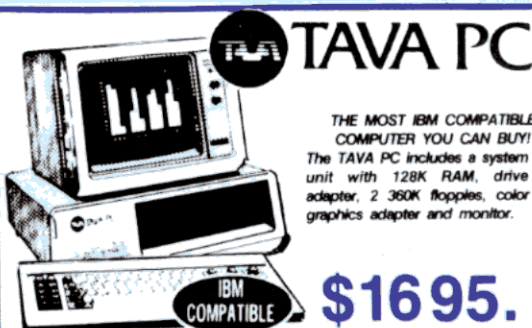
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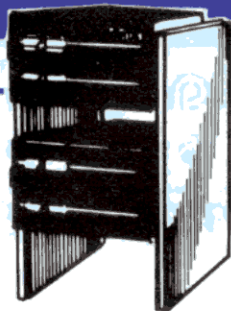
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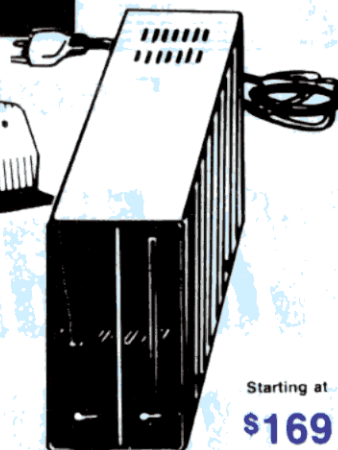


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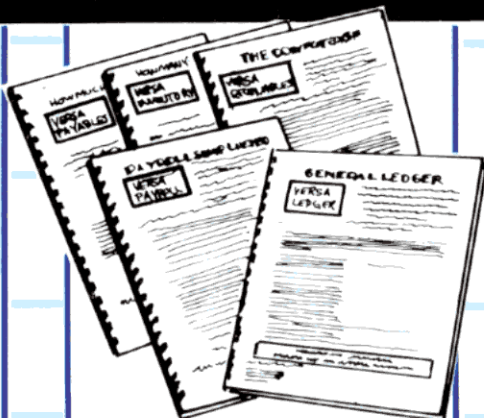
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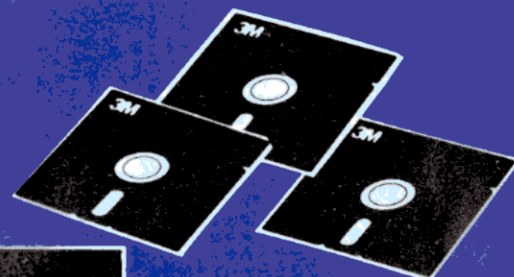
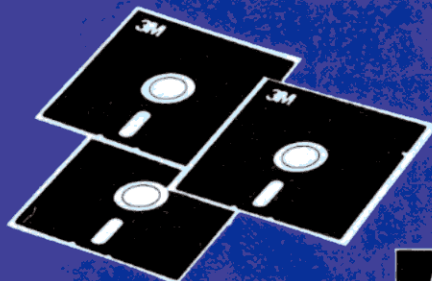
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Creator Update

After making the software buy of the year, Bruce Tonkin's Creator II (February 1984, p. 68), I found that this data base generator wasn't compatible with NEWDOS80. The reason: The lines of Basic code written to a sequential file aren't in numerical sequence. TRSDOS resequences the lines as they're read into memory; NEWDOS80 doesn't. The solution is the NEWDOS80 Do command. If the program is a do-file you can easily convert it to a Basic file and save it without ever leaving the DOS (see the Program Listing).

Dennis Hedrick
13588 Becraft
Chino, CA 91710

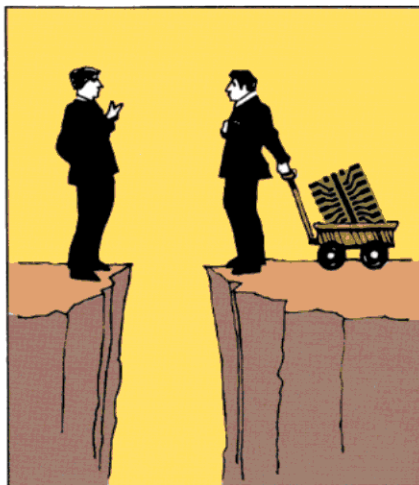
Tonkin Responds

I congratulate Mr. Hedrick on his enhancements: They eliminate the need to sort program lines, and make it easier and faster to write and run programs with The Creator under NEWDOS80. Knowledgeable users make programming a rewarding career.

The suggested changes do cause a few problems, however. First, you're creating two copies of the generated program on disk, leaving less room to save the resulting Basic program. Also, when you execute a do-file, The Creator doesn't check whether it's overwriting a program or file. Another minor concern: You have to exit Basic to run the generated program.

To keep my costs and price low, I'll continue to send out the unaltered version. I hope these modifications will encourage even more readers to get a copy of The Creator from a friend, local user's group, bulletin board, or if all else fails, from me. I still forbid sales of the program without my written permission.

Bruce W. Tonkin
34069 Hainesville Road
Round Lake, IL 60073



Fine Printing

I'd like to respond to John Solie's questions about the C.Itoh 8510A Prowriter parallel printer (July 1984, p. 34). To print double-width (elongated) characters, use CHR\$(14). To turn off the double-width character feature, use CHR\$(15).

Bit-image graphics aren't easy to print. You have to lay out your figure in terms of columns and dots, and determine the code number corresponding to the pattern of dots and spaces in each column. Moreover, to make figures connect from line to line, you must set the line spacing to 1/10 of an inch (CHR\$(27);CHR\$(84);"16").

John's last question related to the dual in-line package (DIP) switches. I'll discuss only switch sets SW1 and SW2, which are directly under the ribbon cartridge when it's at its rightmost position. It's important to note that the switches are numbered 1-8 from left to right in the manual, but from right to left on the printer. In both sets of switches, the open position is toward you. Using O for open and X for closed, here are the switch settings turned around to match their position on the printer:

SW1: X X X O O O X O
SW2: O X O O O O X X

Closing SW2-6 lets you use the graphics mode by typing in CHR\$(27);CHR\$(35); it's easier than bit-image graphics, providing you can assemble the blocks into the figure you want.

Roger G. Christman
1890 Abington Road
Bethlehem, PA 18018

Returns to Sender

I've noticed some confusion about uploading files with the Model 100's Telcom program. The article "Uploading Text to WordStar" (August 1983, p. 210), among others, cites insertion of carriage returns as a disadvantage of Telcom. What I can't understand is why.

You don't need anything fancy to solve the problem. When you're uploading a file, Telcom prompts you for the line width. All you have to do is press the enter key without typing in a number and Telcom sends the file without the extra carriage returns.

Stephen Fournier
15122 Pheasant Drive
Surrey, B.C. V3R 4X6
Canada

Utility Line

Super Utility Plus users should be aware that when you format a data disk with the Format utility, you can't back up that disk using TRSDOS 1.3's Backup utility. However, you can easily back up data disks prepared with the TRSDOS 1.3 Format utility. The reason for the difference apparently is that TRSDOS 1.3 lays down copyrighted code on track 1 while Super Utility Plus doesn't.

Carl Bernofsky
6744 Milne Blvd.
New Orleans, LA 70124

In Search Of...

I'm putting together a collection of word game programs that I intend to

READER EXCHANGE

Program Listing. Changes to The Creator II and The Reporter for NEWDOS users.

Changes to The Creator II

```
270 JN$=PN$+"/JCL":KF$=PN$+"/KEY"+":AN$:DF$=PN$+"/DAT"+":
"+AN$:PN$=PN$+"/BAS":OPEN"0",1,JN$+":BN$:PRINT #1, "BASIC,3V": PRINT
#1,"1 REM*PROGRAM NAME: ";PN$;":PRINT #1,"2 REM* DATA FILE NAME IS
";DF$;":PRINT #1,"3 REM*DATA FILE IS ON DRIVE ";AN$;""
1900 PRINT #1, "SAVE ";CHR$(34);PN$;":BN$:CHR$(34):CLOSE
1910 CLS:PRINT"Your program has been written and saved on the specified
drive. as ";JN$: PRINT "You must now exit to NEWDOS80 and type
DO";JN$:PRINT PN$;" Will be saved and ready to run"
```

Changes to The Reporter

```
390 JN$=PN$+"/JCL"+":DR$:PN$=PN$+"/BAS"+":DR$:
430 OPEN"0",1,JN$:Q$=CHR$(34):PRINT #1,"BASIC,3V"
2636 CLS:PRINT:PRINT "Your program has been written as "; JN$:PRINT "You
must now exit to NEWDOS80 and type DO ";JN$: PRINT PN$;" will be created
and ready to run"
2639 PRINT #1,"SAVE ";Q$;PN$:CLOSE:END
```

End

make generally available. Readers who would like to contribute to the collection—any computer, any language—should contact me. Others who just like to play word games and want more information should send a stamped, self-addressed envelope;

also, indicate what computer you own.

*Eric Balkan
14704 Seneca Castle Court
Gaithersburg, MD 20878*

Colin Alexander's review of the Brother Compactronic 60 typewrit-

er/printer (March 1984, p. 240) included 14 patches that made our unit perform perfectly with Model III SuperScript (used on the Model 4). Now, we've been presented with Model 4 SuperScript 6.01.00 and we find this version won't accept the patches. Can anyone help?

*Floyd Austin
P.O. Box 827
Greenville, CA 95947*

I'm collecting data for a national directory of user's groups. The first edition is scheduled for publication in the spring of 1985. If you'd like your group included, send me a stamped, self-addressed envelope; I'll send you a questionnaire.

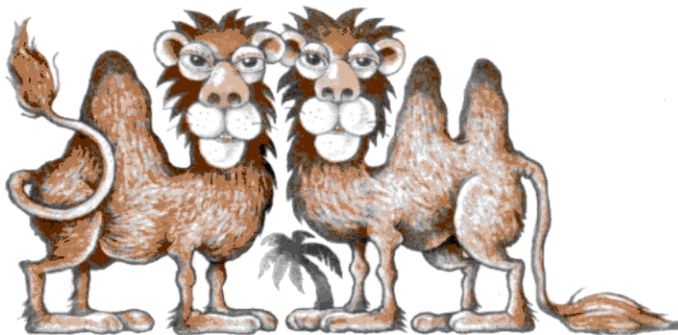
*Ken Ryder
P.O. Box 4102
Rome, NY 13440*

Error Trap

A minor typographical error in the listing for my Model 100 sort program

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READER EXCHANGE

("Sort Order," July 1984, p. 128) makes execution begin at the wrong memory location. The last two digits of line 500 are transposed; the corrected line is:

500 SAVEM "SORT.CO", 61960,62948,61986

*Ronald F. Balonis
118 Rice St.
Trucksville, PA 18708*

The Pulse Train sidebar "Who's Got Clout with Tandy?" (August 1984, p. 24) incorrectly stated that a 36-megabyte hard disk system is available from Radio Shack on special order. According to Tandy's special projects coordinator, Pam Lanier, storage capacity is 30 megabytes and the disk drive is regularly stocked at Radio Shack stores. Lanier also says the correct address to write for information about the Tandy Computer Business User's Group (TCBUG) is TCBUG, P.O. Box 17580, Ft. Worth, TX 76102.

—Eds.

DEBUG

I found it necessary to change two lines in Program Listing 3 of "A Better Breed of Basic" (July 1984, p. 94). They should read:

260 N\$(11) = "L2 E- C"
270 N\$(12) = "L2 G L8 P8 A-A-A-"

*Jim Cornell
San Antonio, TX*

To correct a problem in line 240 of the TEXT6A program of "Bugs from Outer Space" (August 1984, p. 88), change the line to read:

00240 DEFM '!' ' ' #';6

*Roger Smith
505 Ridge Lake Road
Crestview, FL 32536*

Readers have pointed out an omission and an error in my Westminster

Chimes program for the Model 100 (RAM Files, May 1984, p. 172). You should correct the three following program lines to read as listed:

120 IF MID\$(TIME\$,4,2) = "30" THEN
GOSUB 190: GOSUB 210: ELSE 140

270 N = VAL(LEFT\$(TIME\$,2)): IF N > 12
THEN N = N - 12 ELSE IF N = 0 THEN
N = 12

280 FOR J = 1 TO N: SOUND C,L: FOR K = 1
TO 300: NEXT: NEXT: RETURN

The changes complete the chime at the half hour and correct the hourly count at midnight; the change in line 280 eliminates going through the time delay loop in line 290 twice.

*James M. Stubchaer
869 N. Kellogg Ave.
Santa Barbara, CA 93111*

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by Terry Kepner

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Allwrite supports definable screen line widths, 22 programmable function keys, text recovery, automatic hyphenation, file status indicator, footnotes, text preview, text block insertion, If...Then selective printing instructions, and multiple columns of text. It also supports true proportional spacing; automatic index and table-of-contents generation; multiple columns per page; top and bottom page titling; underline, boldface, double-width, and italic characters; superscript, subscript, and backspace capability; hanging indentation (also called bullets); embedded printer graphics; printing of selected pages rather than an entire manuscript; setting special tabs to allow left- and right-column justification; and centered text and decimal column justification (lining up numbers on the decimal). And that's only a partial list.

Combine these features with Allwrite's ease of use and you'll understand my enthusiasm. You can bypass the instruction manual and tutorial altogether and sit down and start working. And if you should get stuck, you can refer to Allwrite's comprehensive built-in Help file to answer

edited by Ryan Davis-Wright



Illustration by Katherine Mahoney

any questions on program operations. It's that easy.

Son of Newscript

Allwrite was developed by Prosoft, the people who sell the Newscript word processing system. But Allwrite isn't just a Newscript upgrade: it's a whole new system, with all the advantages of Newscript and none of its disadvantages.

I've been using Newscript almost from the day it was released. In that time it has earned my respect because of its capabilities: large-based printer support (automatic daisy-wheel support), transportability between Radio Shack computers, automatic table-of-contents generation, automatic index generation, no loss of characters when typing, the ability to chain files and create manuscripts hundreds of pages long, and dozens of other features that make life simpler for writers.

On the other side of the coin, Newscript has earned my ire for some of its deficiencies: it's slow in saving, loading, and printing files; it's line-orient-

ed instead of character-oriented; making tables wider than 60 characters takes lots of work; a rather small work space in memory (12-15K depending on which computer you use), and a few other frustrating "features." But in spite of its flaws, Newscript was the only word processor that could conveniently do what I wanted.

Allwrite has now supplanted Newscript as my word processor of choice, and it only took five minutes to do so.

The Package

Allwrite comes on a double-sided floppy disk. If you have a Model I, the disk contains DOSPLUS TDOS on both sides, and both sides are used for all the modules of the Allwrite system.

The Model III disk has TDOS on one side and TRSDOS 1.3 on the other, with the entire Allwrite system on both sides. The Model 4 disk has TRSDOS 6.2 on side 1 and DOSPLUS IV on the other, again with Allwrite on both sides. This approach reduces problems for customers when ordering the program for their computers.

Setting up Allwrite for your computer is a bit complex. However, if you carefully follow the on-screen instructions (or if you actually read the directions in the manual), you can quickly customize Allwrite to your computer and printer (you can even set up three printer tables, letting you switch among three printers).

The distribution disks for all the computers have the same programs: a text input program (18K); a text formatter program (28K); an installation specification table (1.5K); specifications for the index, table of contents,

and other special files (1.5K); Allwrite keyboard driver (1.5K); a disconnect that returns you to your DOS keyboard driver (1.5K); an on-line help file (25.5K); a utility that converts individual Newscript files to Allwrite format (12K); a Basic program that converts an entire disk of Newscript files to Allwrite format (1.5K); a utility that customizes Allwrite for your computer system (16.5K); a utility that creates a sorted index file (1.5K); a printer table (19.5K); a daisy-wheel and thimble printer table (1.5K each); and three sample text files.

In actual use you only need the text input program, the text formatter program, the installation specification program, and your printer table. If you want to create indexes, tables of contents, mail labels, or legal documents, you also need the specifications utility for those features. If you decide to use the Prosoft keyboard driver, which supplies a type-ahead buffer so you won't lose characters, you need the Allwrite keyboard driver. Finally, if you have room on your drive-zero disk or an available data drive, you should have the Help file on-line.

Once you set up your Allwrite system disk, you're ready to work. When you start, the Prosoft logo appears on the display, and you're prompted for the file name of the document you want to use. If it isn't already on-line, Allwrite advises you that the file name you gave it is a new file and prompts for confirmation before entering the text editor. If the file is on-line, it's immediately loaded into memory, and boy is it fast—only three seconds to load a 25K file.

If you're using a Model I, III, or Lobo Max-80 computer, the display is 64 characters wide by 16 lines long. On the Model 4, the display is 80 columns wide by 24 lines long. Outside of this, the Model 4 version is identical in operation to the other versions (unless you have a 128K Model 4, then you can memory-bank your files so that you can have up to 90K of text in memory simultaneously).

Allwrite is an ASCII text editor and you can load, manipulate, and save to disk any ASCII file with Allwrite. If you have any files created by another word processor, Allwrite can use them as long as you save them to disk in ASCII format.

One feature Allwrite provides that's lacking in most other word processors is a status command to tell you about your file.

If you have any Newscript files, the Newscript converter utility scans them, changing them to the Allwrite format (the control line character is changed from a period to a semicolon, the carriage returns at the end of each Newscript line are removed, and certain Newscript control words are changed to match new Allwrite words). If you have a disk of Newscript files, the disk converter program builds a special file that the Newscript converter reads, automatically reformatting all the disk files rather than prompting for each file name as it normally would.

Allwrite Text Editor

Once you load your file, Allwrite clears the screen and positions the cursor at the upper left-hand corner. Now you can start typing. When you reach the end of the screen, the cursor automatically goes down and over to the next line. If you want, you can rede-

fine the screen width so that you can format lines longer than 64 characters wide, making it easier to prepare tables of information. You select the maximum width allowed for this purpose in the installation procedure. You would normally choose a maximum width of 80 characters since that's the limit of standard 8½-inch paper using 10 characters per inch printing, but you can specify up to 254 characters per line in the installation process. If you use the Length command to reset the normal screen width, the entire display scrolls to the left when you reach the right edge of the screen.

In addition to the arrow keys, you have 41 control keys to maneuver the cursor and text around in the text buffer. The control key is the clear key, and all keys repeat if held down. You can specify how much time you want to pass before a key starts repeating itself and how fast it repeats when you set up the installation program.

You also have 36 commands available as text editor commands. These provide the more complex functions such as getting a disk directory, text search and replace, file statistics, and so forth. One feature Allwrite provides that's lacking in most other word processors is a status command to tell you about your file. Allwrite not only tells you the number of characters currently in your file, it also tells you how many characters are left, the total space available, the word count, line count, current screen width, type of printer selected, number of changes you've made to the text, the name of the last file edited, the current file's name, the name of the next file (if you're invoking the Link command), the text last used for Search, the text last used for Replace, and, if you're using a 128K Model 4, which RAM area you're currently using (1, 2, or 3).

Another useful feature involves "soft" keys. These are 22 keys (the numerals zero to nine, both normal and shifted, and the characters X, Y, and Z) to which you can assign definitions. You can define them to stand for anything normally typed in from the keyboard, including commands, escape sequences, control keys, words, phrases, and even other soft keys.

To use one, you press the clear key and the appropriate soft key. Each

Allwrite



Prosoft
P.O. Box 560
North Hollywood, CA 91603
Models I and III, 48K RAM
Model 4, 64K RAM
Two disk drives, or one disk drive
and one hard drive
\$249.95

Easy to use? ★★★★★
Good docs? ★★★★★
Bug free? ★★★★★
Does the job? ★★★★★

80

284

soft key holds 22 characters, but if that's not enough room you can call one soft key from another, chaining them together. The only disadvantage to the soft keys is also their advantage: they accept every keystroke as a valid command, including control keys, so if you make a mistake, you can't use the backspace key to go back and fix the error. Instead, you must end the definition and restart it.

Allwrite also provides a command, Whoops, that lets you recover from a mistake. For example, if you've just accidentally erased three lines, pressing the break key and typing in WHOOPS restores all the text on the screen to its original condition. You may lose some editing changes, but you'll recover the text you lost. This has saved me several times. However, Whoops is limited to the text displayed on the screen, so anything that has scrolled off, either up or down, can't be recovered with this command.

Allwrite supports both manual and automatic hyphenation. With manual hyphenation, you set "soft" hyphens in each word you expect to find at the end of a line, and the text formatter uses this hyphen, if needed, to even out the right margin or reduce the character spacing when using full justification.

Automatic hyphenation uses Electric Webster's preprogrammed hyphens to soft hyphenate every word in your file. The soft hyphens aren't printed unless the word needs to be split between two lines. This is more convenient than the manual method, and much more accurate since Electric Webster marks only the correct positions for word breaks. The disadvantage is that it increases the size of your file by about 20 percent, but that's a small price to pay for neat text margins and spacing in the finished document.

Text Formatting

You usually embed text formatting commands in the actual text of your document. You put them on a line by themselves, with each command starting with the semicolon. To get the commands on a separate line, you have to terminate the previous line of text with a carriage return, symbolized by a backwards graphic "L." If the previous line isn't terminated with a carriage return, Allwrite considers the

*If you accidentally
erase three lines,
press the break key
and type WHOOPS
to restore the text
on the screen to
its original condition.*

command line an extension of the previous text.

The text formatter responds to 79 commands, giving it unprecedented flexibility. Not only do you have complete control over the margins, justification, and standard formats in the document, you also have control over things like embedding other files in the document you're printing, appending files into a long chain, establishing the parameters for true footnoting, previewing the document on your video, changing line printer pitch, using logical If...Then instructions to control printing sequences, and printing multiple columns of text on any printer.

The logical operations are a bit complex and require some programming skill, but once you get the hang of them, they become indispensable. By using labels to define blocks of text, you can use the logic operations to select which block you want to print. You can set up a form letter for dealing with delinquent accounts that would change the body of a letter according to whether the recipient was 30, 60, or 90 days overdue. This logic selection is limited to integer numbers in the range - 32768 to + 32767.

Allwrite can do all this because it formats each page of your document in RAM before it starts printing. It knows just how many lines it will print per page and the exact format of each line before it sends the first character to your printer. For multiple columns, it lays out the page in memory exactly the way it'll appear on paper.

Summary

Allwrite is a professional system that sets a new standard in word processing. It's powerful and easy to learn and use. The on-line help file means

you shouldn't have to bother with the manual except for complex or little-used features. The tutorial, while nice, is almost unnecessary for all but the true word processor novice.

Allwrite lets you use all your printer's features with a minimum of trouble, no matter how simple or complex.

The table-of-contents and index generation features are invaluable in preparing long documents or books, and they're limited only by your computer's memory constraints. On my machine, the maximum size of an index file is 35K, almost 15 pages of double-column listings. And the table of contents can be just as large.

Allwrite even supports the special needs of the legal community, with their "boilerplate" documents and unusual line numbering requirements.

Allwrite is a serious tool for the serious writer. While it may be a bit pricey, it's worth every penny in improved productivity and capabilities. ■

Priced-Less Printers: Three Radio Shack Entries

by Beve Woodbury
and Mare-Anne Jarvela

Radio Shack recently introduced three new dot-matrix printers for under \$1,000. They are the DMP-110, the DMP-120, and the DMP-420. While all three printers performed well, they differed in print quality and features offered. For instance, the DMP-110 had the poorest quality print but provided some useful features like superscripting and subscripting. On the other hand, the DMP-120 produced clear print, but lacked the 110's variety of print styles.

We compared printing speed, print quality, and features for each printer. For a quick comparison, see Table 1 on p. 40.

```
10 A$ = "TIMES"
20 FOR K = 1 TO 50
30 LPRINT "TESTING FOR TIME";
40 NEXT K
50 B$ = "TIMES"
60 LPRINT:LPRINT:LPRINT A$,B$
```

Figure. Printing speed test.

REVIEWS

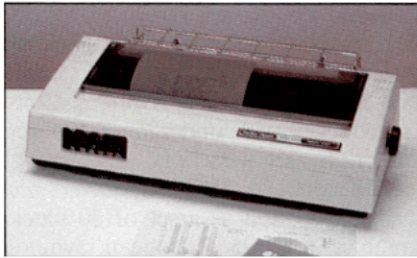


Photo 1. DMP-110.

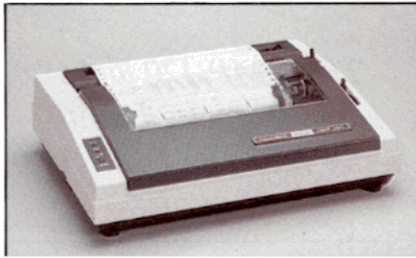


Photo 2. DMP-120.

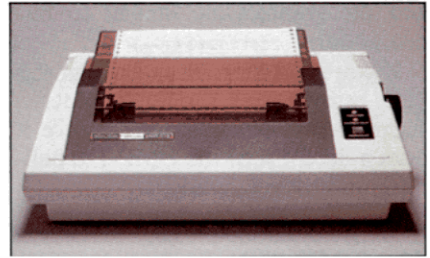


Photo 3. DMP-420.

The DMP-110

This is the least expensive of Radio Shack's dot-matrix printers. It also produced the least readable print.

Physical Description and Set-up

The \$399 DMP-110 is one of the smallest printers Radio Shack offers (4½ by 16½ by 12½ inches and weighing about 12 lbs.). Like the DMP-120 and -420, the DMP-110 is ivory with a small black control panel. It accepts fan-fold (tractor-feed) or single-sheet paper, no wider than 10 inches.

The DMP-110 is simple to set up and hooks up to a serial or parallel computer. The 110's input switch is on the rear of the printer with the serial input offering a choice of 600- or 1,200-baud operation.

Specifications

The DMP-110 functions in three different modes: data processing, word processing, and graphics printing. The data and word processing modes work in a similar manner, the only difference being in the line-feed

commands. In the word processing mode, a line feed advances the paper instantly, which doesn't occur in the data processing mode.

The printer offers six different character fonts: standard, condensed, correspondence-quality (double-strike), proportionally spaced, italics, and microfont. In addition, you can print the standard characters in two widths: normal, at 10 characters per inch (cpi), and elite, at 12 cpi. You can also elongate (double the width of) any of the character styles. The correspondence-quality and proportionally spaced character sets include 64 special and European characters.

Boldfaced characters and underlining are available by using certain control codes. The 110 also supports superscripting and subscripting, a handy feature that works well.

The graphics mode lets you position the print head (a two-hammer system) where you want to print a dot on the paper. The manual gives an example of "freehand drawing." But after entering all the data (and there's a lot to enter, even for a small picture) we didn't

get the result we or the manual wanted. Could there be typos in the manual?

Even though we didn't have any luck with free-form drawing, one nice feature is that you can combine graphics with text.

The first DMP-110 we received to review had a problem. The print head would stick half-way through printing a line, and you would have to turn the machine off and on to get it to unstick. The replacement printer functioned perfectly.

The Documentation

The manual is easy to follow and has several short programs to demonstrate printer features; we didn't have trouble with any of them. A schematic diagram and a section called "If You Have a Problem" round out the manual.

While it's an easy-to-use printer with a variety of font styles, the DMP-110 is somewhat restrictive. The print is readable but doesn't quite measure up to the almost-letter-quality print of the DMP-120 or DMP-420. It's the slowest of the three printers

DMP-110



Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
\$399

Easy to use? ★★★★★☆
Good docs? ★★★★★☆
Well made? ★★★★★☆
Does the job? ★★★★★☆

DMP-120



Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
\$499.95

Easy to use? ★★★★★☆
Good docs? ★★★★★☆
Well made? ★★★★★☆
Does the job? ★★★★★☆

DMP-420



Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
\$999

Easy to use? ★★★★★☆
Good docs? ★★★★★☆
Well made? ★★★★★☆
Does the job? ★★★★★☆

and the graphics are limited to bit-matrix only.

If you're looking for more than this in a printer, you should consider a slightly more expensive one. While it does a decent job, the DMP-110 definitely has some limitations.

The DMP-120

Quality of print makes the DMP-120 well worth the \$100 over the DMP-110. The letters are crisp, clear, and come close to letter-quality. While the DMP-120 lacks several of the DMP-110's features (such as different print fonts), it's certainly the better printer.

Physical Description and Set-up

This compact printer measures 5 by 16½ by 13½ inches and weighs about 16 pounds. If you use roll paper, the paper roll holder adds seven inches to the depth. You wouldn't call it a quiet printer, but you've probably heard a lot louder ones.

The set-up is quick and easy and directions are clear and simple. Diagrams and instructions step you through loading each of the three

The DMP-120 lacks some features, but it's better than the DMP-110.

kinds of paper the DMP-120 accepts: single-sheet, roll, and tractor-feed.

There is the choice of an 8-bit parallel interface or an 8-bit, 600 or 1,200 bits-per-second serial interface. You can use this printer with all the TRS-80 computers, including the Color Computers.

Specifications

Bidirectional carriage motion prints approximately 120 characters per second in standard pitch, 80 characters per line and 6, 8, or 12 lines per inch (computer-selectable). In a printing test we ran (see the Program Listing), the DMP-120 printed twice as fast as the DMP-110.

You have the option of two printing modes: character printing for text, and graphics mode for pictures or graphs. You can print both on the same line and each has a normal (10

cpi) and condensed (16.7 cpi) pitch. The character printing mode also has an elongated pitch for normal (5 cpi) and condensed (8.35 cpi) modes. Control codes provide underlining, but not subscripts or superscripts.

The standard ASCII characters are available as well as a set of 30 block graphics and 25 European symbol codes. Be forewarned that these codes are in a different order on the Model 4P. POKE 16892,02 on the Model 4P to put them in the correct order.

The bit graphics are printed with clear, well-defined edges. The block graphics set, according to the manual, "is not fully compatible with the screen graphics of any of the TRS-80 computers; rather it is a unique character set."

The Documentation

Most of the manual is clear and easy to understand, but it lacks an index, which would be helpful for reference. There are sections on care and maintenance, troubleshooting, interfacing, and a schematic diagram.

The manual does offer several small programs to demonstrate the use of the printer. Unfortunately, the explanations of just what the programs do are unclear. For example, the program on page 33 to demonstrate the use of bit graphics for drawings is presented in a confusing way and is out of order. Despite what the manual says, the end product is certainly not "worth the effort." And the program doesn't work correctly. A page of corrections is available if you call Radio Shack customer service. But even with the corrections, we couldn't decipher the picture.

The manual mentions that the seven vertical dots in a dot-column aren't numbered 1-7, but fails to mention that they are numbered 1, 2, 4, 8, 16, 32, 64. The lack of explanation on use of the graphics would be especially frustrating for a beginner attempting to learn how to use the printer for graphics applications.

The DMP-120 would be our choice for a printer. While the graphics documentation is lacking, and it's a little disappointing to sacrifice super-/subscripting and italics, it has excellent print quality and the size and price are attractive. It's comparable to the DMP-420 on a features/cost basis.

Specification	DMP-110	DMP-120	DMP-420
Price	\$399	\$499.95	\$999
Weight	12 lbs.	16 lbs.	35 lbs.
Paper:			
Fanfold	Yes	Yes	Yes
Single-sheet	Yes	Yes	Yes
Roll	No	Yes	No
Serial	Yes	Yes	Yes
Parallel	Yes	Yes	Yes
Speed*	23 seconds	12 seconds	7 seconds
Self-test	No	Yes	Yes
Print fonts:			
Standard	Yes	Yes	Yes
Condensed	Yes	Yes	Yes
Correspondence	Yes	No	Yes
Proportional	Yes	No	Yes
Italic	Yes	No	No
Microfont	Yes	No	No
Print modes:			
Data processing	Yes	Yes	Yes
Word processing	Yes	No	Yes
Graphics	Yes	Yes	Yes
Super-/subscript	Yes	No	Yes
Underline	Yes	Yes	Yes
Elongated	Yes	Yes	Yes
Boldface	Yes	No	Yes
Right-Justify	Yes	No	Yes

Table 1. Comparison of the DMP-110, DMP-120, and DMP-420 printers.

Continued on p. 178

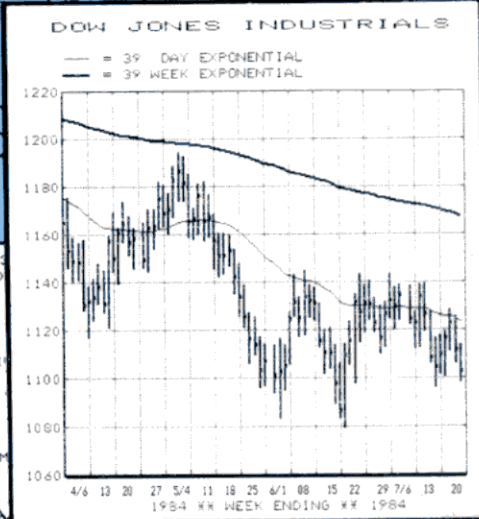
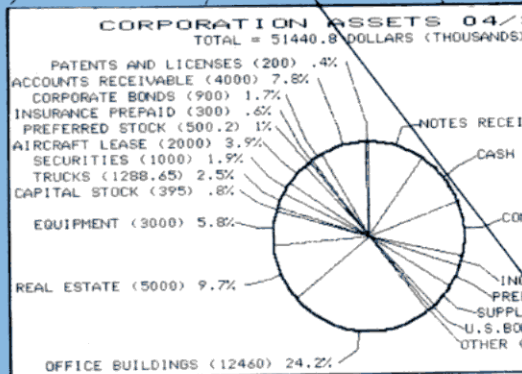
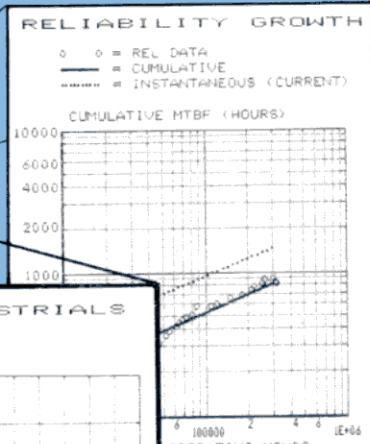
DATAGRAPHTM

PRINTER
GRAPHICS
PROGRAM

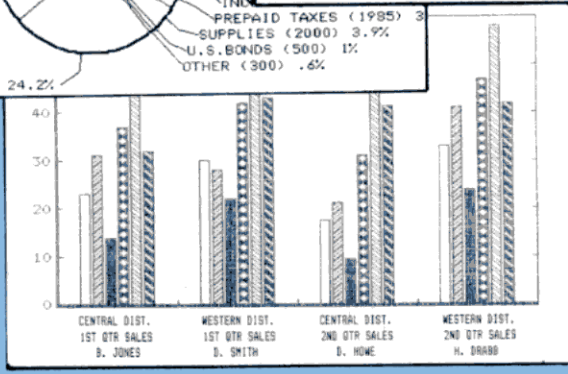
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1231	77.86	963.77	378.10	114.42	135.76	1040	573	24,038	11,336
122	78.26	972.76	381.43	115.12	136.34	1032	495	17,275	9,455
105	79.38	972.65	405.77	117.61	137.19	1024	433	11,157	14,669
106	79.14	981.69	402.89	117.16	136.12	1047	540	30,443	23,769
107	77.27	987.09	391.19	115.19	135.00	1047	555	27,987	85,844
108	78.20	985.70	388.21	114.09	133.04	1028	11,759	37,775	
109	78.44	980.67	384.67	112.87	131.48	1007	620	28,933	15,739
112	78.52	982.77	388.34	112.85	131.52	928	633	23,813	19,192
113	78.35	985.10	387.10	112.49	133.24	978	993	12,487	24,532
114	78.55	986.47	389.55	112.38	133.47	944	612	22,382	12,773
115	78.77	989.07	376.10	112.69	131.73	789	671	21,567	13,526
116	77.33	973.27	421.78	113.22	134.77	890	642	22,22	14,423
119	78.10	970.79	401.55	114.35	134.75	740	756	16,716	15,138
120	75.34	950.68	394.89	113.80	131.83	371	1172	5,689	
121	75.37	946.25	392.46	113.80	131.35	517	154	15,717	
122	74.76	940.44	372.63	113.00	130.28	481	1024	11,057	
123	74.72	940.19	371.61	111.78	130.25	481	780	16,654	
126	74.45	938.91	369.19	111.47	129.84	534	896	14,894	
127	75.19	949.41	374.64	111.72	131.15	943	557	28,794	
128	74.79	942.50	375.43	112.49	131.34	626	788	14,423	
129	74.69	946.07	383.84	112.74	132.28	774	710	17,435	
130	74.27	947.27	402.22	112.82	129.55	727	776	16,777	

WORKSHEET			
Yours	NYSE Vol	100 NYCI	A-B
1231	41.21	77.43	447
122	28.87	77.47	520
105	38.81	77.75	573
106	67.40	78.98	407
107	92.89	77.89	133
108	55.35	77.57	450
109	58.19	77.30	297
112	48.76	77.23	295
113	10.99	77.07	415



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 • 15 Amps, 125 Volts, 1875 Watts • Operating Temperature: -40°C to +85°C • Peak Pulse Power Dissipation @ 25°C, 585,000W for 100 Sec. • Maximum Clamping Voltage @ Test Current 50A (8/20 sec.) 340V Clamping Occurs Line to Line (normal mode) and Line to Ground (common mode) • Clamping Response Time: 1 Nanosecond (1 x 10⁻⁹ sec.) • Dielectric Test: 3000VAC 60 Sec. • Forward Surge Rating @ 25°C, 1440 Amps for 1/120 Sec.

\$49.95



RUBY SPF-2

Switched; EMI - RFI filters; plugs into duplex outlet; 6 ft. power cord with built in circuit breaker/switch; six outlets. • 15 Amps Total, 125 Volts, 1875 Watts • Operating Temperature: -40°C to +85°C • Peak Pulse Power Dissipation @ 25°C, 585,000W for 100 Sec. • Maximum Clamping Voltage @ Test Current 50A (8/20 sec.) 340V Clamping Occurs Line to Line (normal mode) and Line to Ground (common mode) • Clamping Response Time: 1 Nanosecond (1 x 10⁻⁹ sec.) • Dielectric Test: 3000VAC 60 Sec. • Forward Surge Rating @ 25°C, 1440 Amps for 1/120 Sec. • Mode Noise Protection: Normal and Common Mode • Noise Rejection Frequency: 150 KHz - 30MHz • Attenuation: 50dB - 58dB

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 ing Temperature: -40°C to +85°C • Peak
 Pulse Power Dissipation @ 25°C, 585,000W for
 100 Sec. • Maximum Clamping Voltage Occurs
 Current 50A (8/20 sec.) 340V Clamping Voltage
 Line to Line (normal mode) and Line to Ground
 (common mode)
 • Clamping Response Time:
 1 Nanosecond (1 x 10⁻⁹ sec.)
 • Dielectric Test:
 3000VAC 60 Sec. • Forward
 Surge Rating @ 25°C, 1440
 Amps For 1/120 Sec.

\$59.95

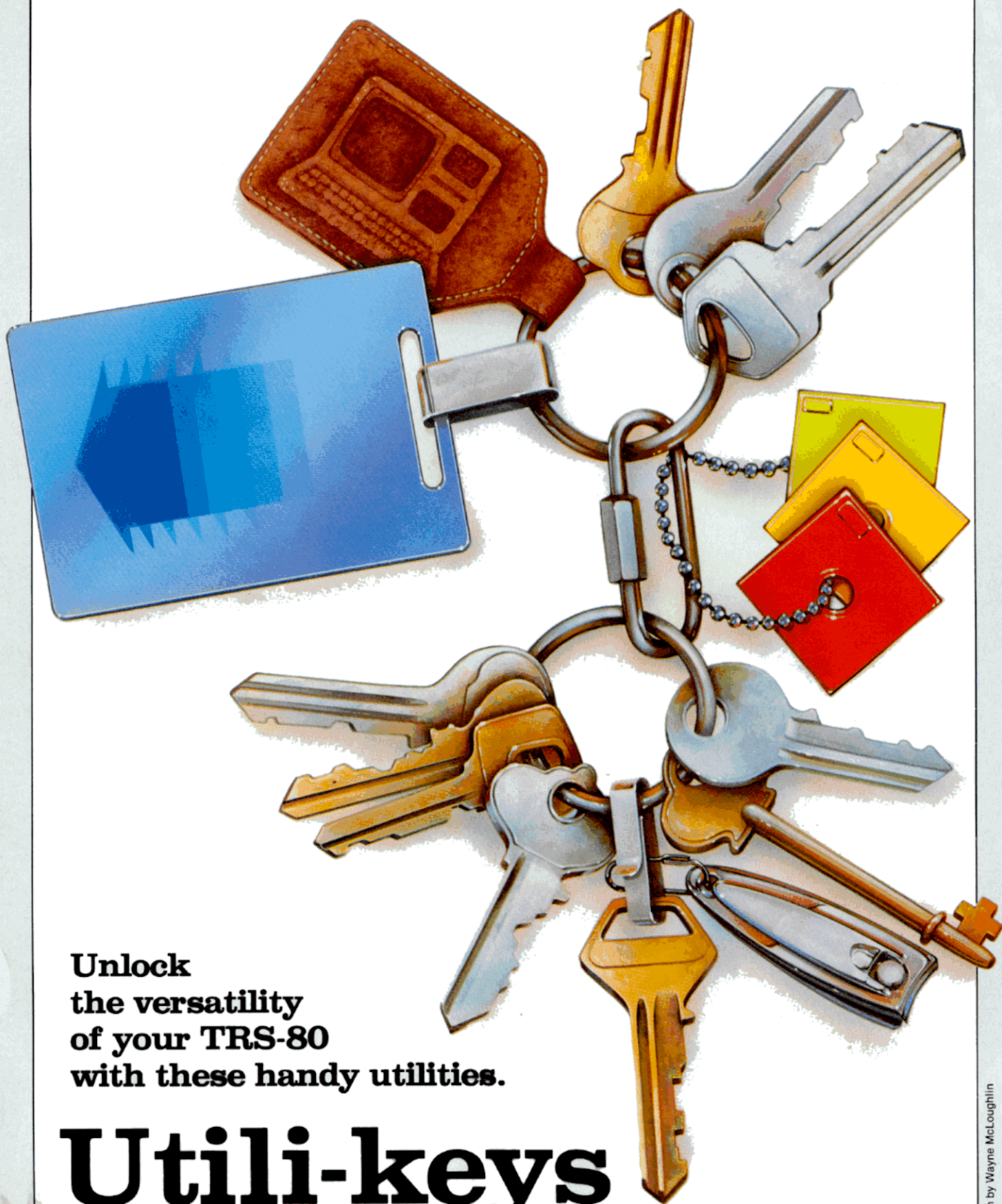


SAPPHIRE SPF-1

Switched; EMI-RFI filtered; adapts duplex outlet; three
 outlets. • 15 Amps Total, 125 Volts, 1875 Watts • Operat-
 ing Temperature: -40°C to +85°C • Peak Pulse
 Power Dissipation @ 25°C, 585,000W to 100 Sec.
 • Maximum Clamping Voltage @ Test Current 50A (8/20
 Sec.) 340V Clamping Voltage Line to Line (normal
 mode) and Line to Ground (common mode) • Clamp-
 ing Response Time: 1 Nanosecond (1 x 10⁻⁹ sec.)
 • Dielectric Test: 3000VAC 60 Sec. • Forward Surge
 Rating @ 25°C, 1440 Amps for 1/120 Sec. • Mode
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Fourteen new commands enhance Level II
Cassette Basic and use only 1.5K of RAM.

Basic Plus

by Robert Milazzo

Basic Plus, a pumped-up version of Level II Cassette Basic, gives you 14 new

Basic commands that not only enhance conventional Basic, but operate much faster than their Basic counterparts. The Assembly-language program uses only 1.5K of memory and runs on a 16K Model III.

Basic Plus features a utility to recover accidentally lost programs because of a system reset or execution of a New command, improved USR and Restore commands, and a simple set of commands to activate and deactivate the clock display and to provide a measured delay in a program. It also provides a command that gives your Model III sound capability.

Other features include multibyte PEEK and POKE commands, a command that sets memory size without requiring a reboot, and a utility that removes all unnecessary spaces from programs.

Additionally, these commands accept both hexadecimal and decimal operands. The program lets you specify the starting point of Basic programs anywhere in RAM—allowing you to use low RAM for Assembly-language programs.

Assembling the Program

As a whole, Basic Plus is too large to fit into a cassette-based assembler all at once. To solve this problem, I split the program into two pieces, and provided the necessary equates to connect them. I used a method similar to Gil Spencer's in the July 1981 issue of *80 Micro* ("Enhance Your Level II Basic," p. 202). Assemble the first section of the program (Program Listing

1) and call it One, then assemble the second section and call it Two (Program Listing 2).

Loading the Program

Load Basic Plus using Basic's System command. First, set the memory size to 30999. After you load the two sections, type in /31000. This activates Basic Plus's extra commands. If you get an L3 error message when you try to use Basic Plus, type in /31000 in the System mode to regain control.

The Commands

The syntax of these new commands is easy once you learn it. You must precede each new command with the disk command CMD. The program activates this command so that you can use non-disk systems without getting an L3 error. Most commands and most expressions accept both decimal and hexadecimal arguments.

CMD LOMEM &5C00 indicates when the computer should begin storing programs in RAM. In this example, storage begins at 5C00 hexadecimal (hex). The Model III normally starts storing programs at 43E9 hex or 17385 decimal. You can write the address in decimal or as an expression, such as CMD LOMEM 25700 + 100. The ability to adjust the starting point of programs in RAM is useful when using Basic disassemblers or machine-language programs that load into the lower portion of memory.

CMD HIMEM &7F29 lets you answer the memory size prompt without having to reboot the system. Again, you can use either decimal or hexadecimal values. The HIMEM command lets you preserve high memory for machine-language programs. Always enter a CLEAR 50 statement after the

HIMEM command to preserve some string space.

CMD SAVE needs no argument and instructs the computer to save the program that currently resides in memory. You can't destroy programs saved in this manner with a New command or a system reset. This is helpful when you run Basic programs that contain machine-language subroutines. By pressing the reset button to regain control when the program locks up, you delete the contents of RAM. This forces you to CLOAD a copy, if you have one. Using the Save command lets you retrieve the program.

CMD RENEW works with the Save command. To see how it works, type in any short program, then type CMD SAVE and press the enter key. Press the reset button a few times, and enter the Basic New command a few times as well. Normally, this wipes out your original listing.

However, with Basic Plus, you can type in CMD RENEW followed by the Basic List command and retrieve your program. The only way to lose a program in RAM is to turn off your computer.

While CMD GET &43E9,A,B,C,D and similar commands differ from ordinary Basic commands, they are no more difficult to use. The Get command is equivalent to the Basic state-

The Key Box



**Model III
16K RAM
Cassette Basic
Assembly Language
Editor/Assembler**

ments PEEK(17385)+PEEK (17386)*256 (43E9 hex is equal to 17385 decimal). The total is returned in variables A, B, C, and D. There is no limit to the number of variables into which you can put the 2-byte PEEK. As in all of the other commands, you can use both hexadecimal and decimal constants. The following example makes this command clear.

```
10 A = 16526
20 CMD GET A,X,Y
```

This short program returns, in the X and Y variables, the values stored in 16526 and 16527 in least significant byte/most significant byte format. All variables that receive the result of the 2-byte PEEK are single-precision. Otherwise, a function error occurs.

The only other restriction on the Get command is in its first argument. Basic Plus expects all of its first arguments in hexadecimal value to be four characters long. Use leading zeros whenever necessary. CMD GET &234, A is not legal while CMD GET &0234,A is—since the first argument is a four-character expression.

CMD DELAY 15 instructs the computer to do nothing for a user-specified amount of time. It allows only decimal constants or expressions, and you must limit the range of the argument to between zero and 59 seconds. The command, as shown above, causes a 15-second delay. This is convenient whenever you need a timing loop in a program (saving you the trouble of having to use a For... Next loop).

CMD OPEN doesn't require any parameters. It prints the time in hours, minutes, and seconds in the right-hand corner of the video screen. To set the clock, refer to the Model III reference manual.

CMD CLOSE requires no arguments and works in conjunction with the Open command to turn off the clock display.

CMD EX\$ A\$,B\$ exchanges the values of pairs of strings. This command is useful in sorting programs that involve strings. There are no limitations to the number of exchanges possible as long as they are in pairs. For example, CMD EX\$ E\$,B\$,H\$,

is illegal because the lonely H\$ has no string to switch with.

CMD USR 25000,HL = 100,DE = 3054,BC = 50,A = 255 RETURN X = HL,Y = DE looks scary, but this command is a great improvement over the weak Basic USR command. In fact, it is the most powerful Basic command I've ever seen and will come in handy for those of you who use machine-language subroutines.

This command lets you pass up to 11 values of a machine-language subroutine. After returning to Basic, the subroutine can return up to six values in the variables you specify. The Basic USR command permits the passing of only one value to and from a machine-language subroutine.

To study the command more closely, make a call to the subroutine at location 25000 decimal—an arbitrary number that is either an expression or a hexadecimal constant. (Make sure that the hexadecimal constants are four characters long.)

The program passes parameters to the routine by directly loading the various register pairs. The command

Program Listing 1. Basic Plus, Part 1.

```
7918      00100      ORG      31000
          00101 ;PROGRAM LISTING ONE
          00102 ;COPYRIGHT
          00103 ;ROBERT MILAZZO
          00104 ;3604 LIGHTHOUSE AVE
          00105 ;LAS VEGAS,NEVADA 89110
7C1B      00110 SOUND EQU 7C1BH
7C8C      00120 SAVE EQU 7C8CH
7CAA      00130 RENEW EQU 7CAAH
7D33      00140 USR EQU 7D33H
7F47      00150 GET EQU 7F47H
7918 212179 00160 LD HL,LOOP1
791B 227441 00170 LD (16756),HL
791E C3EF1A 00180 JP 1AEFH
7921 7E 00190 LOOP1 LD A,(HL)
7922 23 00200 INC HL
7923 FE20 00210 CP 32
7925 28FA 00220 JR Z,LOOP1
7927 FE4F 00230 CP 'O'
7929 FA3979 00240 JP M,TABLE1
792C FEA5 00250 CP 165
792E FA5079 00260 JP M,TABLE2
7931 FEFA 00270 CP 250
7933 FA6C79 00280 JP M,TABLE3
7936 C39719 00290 JP 1997H
7939 FE45 00300 TABLE1 CP 'E'
793B CA8F79 00310 JP Z,EXCH
793E FE44 00320 CP 'D'
7940 CA947B 00330 JP Z,DELAY
7943 FE4C 00340 CP 'L'
7945 CADE79 00350 JP Z,LOMEM
7948 FE48 00360 CP 'H'
794A CAB37B 00370 JP Z,HIMEM
794D C39719 00380 JP 1997H
7950 FE53 00390 TABLE2 CP 'S'
7952 CA1B7C 00400 JP Z,SOUND
7955 FE44 00410 CP 164
7957 CA477F 00420 JP Z,GET
795A FE90 00430 CP 144
795C CA4C7B 00440 JP Z,RESTOR
```

```
795F FE52 00450 CP 'R'
7961 CAAA7C 00460 JP Z,RENEW
7964 FEA2 00470 CP 162
7966 CACF79 00480 JP Z,OPEN
7969 C39719 00490 JP 1997H
796C FEA5 00500 TABLE3 CP 165
796E CA767A 00510 JP Z,PUT
7971 FEAD 00520 CP 173
7973 CA8C7C 00530 JP Z,SAVE
7976 FEA6 00540 CP 166
7978 CAC079 00550 JP Z,CLOSE
797B FEB6 00560 CP 182
797D CADF7A 00570 JP Z,DELETE
7980 FEC1 00580 CP 193
7982 CA337D 00590 JP Z,USR
7985 C39719 00600 JP 1997H
7988 7E 00610 CHKSPC LD A,(HL)
7989 FE20 00620 CP 32
798B C0 00630 RET NZ
798C 23 00640 INC HL
798D 18F9 00650 JR CHKSPC
798F 23 00660 EXCH INC HL
7990 23 00670 AGAIN INC HL
7991 CD8879 00680 CALL CHKSPC
7994 CD0D26 00690 CALL 260DH
7997 D5 00700 PUSH DE
7998 23 00710 INC HL
7999 CD8879 00720 CALL CHKSPC
799C CD0D26 00730 CALL 260DH
799F E5 00740 PUSH HL
79A0 DDE1 00750 POP IX
79A2 E1 00760 POP HL
79A3 0603 00770 LD B,3
79A5 4E 00780 SWAP LD C,(HL)
79A6 1A 00790 LD A,(DE)
79A7 77 00800 LD (HL),A
79A8 79 00810 LD A,C
79A9 12 00820 LD (DE),A
79AA 23 00830 INC HL
79AB 13 00840 INC DE
79AC 10F7 00850 DJNZ SWAP
79AE DDE5 00860 PUSH IX
79B0 E1 00870 POP HL
79B1 CD8879 00880 CALL CHKSPC
```

Listing 1 continued

loads the HL register pair with the value of 100 decimal, the BC register pair with 50 decimal, and the accumulator (the A register) with 255 decimal—another arbitrary number. The routine sets any register pair not assigned a value to zero.

CMD USR lets you directly load the HL, DE, BC, IX, IY, and A registers with any value you want. After passing all parameters and making a call to the machine-language subroutine, the first part of CMD USR is complete. Unlike the Basic USR command, you need not worry about putting the address of the subroutine in locations 16526 and 16527.

To return to the Basic program that called the subroutine, use a return command (RET in Assembly language) as the subroutine's last line.

Once the computer finds the return instruction, it passes control to the second part of the CMD USR command (following the return statement in that command). You can directly load the Z80 register pairs with any variables you want here. This is how Basic Plus passes parameters back to Basic.

In the example given, the X variable has the value of the DE register pair, and the Y variable has the value of the HL register pair. You can receive the values of the HL, DE, BC, IX, IY, and A registers and put them into any Basic variable as long as the variable is single-precision. If one of the receiving variables is not single-precision, you'll get an error message.

The command is flexible with its many possible variations. If you don't want to receive any values, you can pass them using the statement CMD USR 25000, HL=&0235. To receive values, use CMD USR 25000 RETURN U=IX. This assigns the Basic variable U with the value of the IX register pair. Although this command simply calls a subroutine with CMD USR &01C9, remember you always pass values to the subroutine due to the fact that any register pair not given a value automatically has the value of zero before you make the call.

More Commands

CMD PUT &3C00,191,191,191,191 is a multibyte POKE that lets you

POKE either decimal or hexadecimal values into successive memory locations. As written here, the command POKES the values of 191 decimal into locations 3C00, 3C01, 3C02, and 3C03 hexadecimal.

The following variation of the command is also legal: CMD PUT 15360, &FF FF FF FF. This variant POKES locations 15360-15363 decimal with hexadecimal value FF (255 decimal). The only difference between hexadecimal and decimal is the absence of a comma between the hex values. All hexadecimal values must be in pairs; write 13 in hexadecimal as 0C, not just C. Entries not written in pairs produce an error message.

You don't have to put spaces between hex constants; I use them only for clarity. An expression such as CMD PUT &3C000, A,B,C,D,X is legal as long as the variables A, B, C, D, and X are fewer than 256 bytes long. If they are larger, an error message results.

This command is useful for doing such things as POKEing entire machine-language programs into memo-

Listing 1 continued

79B4 FE2C	00890	CP	','	7A06 FE3A	01310	CP	','
79B6 2808	00900	JR	Z,AGAIN	7A08 2806	01320	JR	Z,LOEND
79B8 FE3A	00910	CP	','	7A0A B7	01330	OR	A
79BA C8	00920	RET	Z	7A0B 2803	01340	JR	Z,LOEND
79BB B7	00930	OR	A	7A0D C39719	01350	JP	1997H
79BC C8	00940	RET	Z	7A10 CD491B	01360	LOEND CALL	1B49H
79BD C39719	00950	JP	1997H	7A13 C3EF1A	01370	JP	1AEFH
79C0 CD8879	00960	CALL	CHKSPC	7A16 0602	01380	LD	B,2
79C3 CDA102	00970	CALL	2A1H	7A18 1802	01390	JR	PROG
79C6 7E	00980	LD	A,(HL)	7A1A 0601	01400	LD	B,1
79C7 FE3A	00990	CP	','	7A1C 114A7A	01410	PROG	LD,HEXMSB
79C9 C8	01000	RET	Z	7A1F 23	01420	PROG1	INC HL
79CA B7	01010	OR	A	7A20 CD8879	01430	CALL	CHKSPC
79CB C8	01020	RET	Z	7A23 D630	01440	SUB	30H
79CC C39719	01030	JP	1997H	7A25 FE0A	01450	CP	10
79CF CD8879	01040	CALL	CHKSPC	7A27 3802	01460	JR	C,HEX5
79D2 CD9802	01050	CALL	298H	7A29 D607	01470	SUB	7
79D5 7E	01060	LD	A,(HL)	7A2B CB27	01480	HEX5 SLA	A
79D6 FE3A	01070	CP	','	7A2D CB27	01490	SLA	A
79D8 C8	01080	RET	Z	7A2F CB27	01500	SLA	A
79D9 B7	01090	OR	A	7A31 CB27	01510	SLA	A
79DA C8	01100	RET	Z	7A33 F5	01520	PUSH	AF
79DB C39719	01110	JP	1997H	7A34 23	01530	INC	HL
79DE 23	01120	LOMEM INC	HL	7A35 CD8879	01540	CALL	CHKSPC
79DF 23	01130	INC	HL	7A38 D630	01550	SUB	30H
79E0 23	01140	INC	HL	7A3A FE0A	01560	CP	10
79E1 00	01145	NOP		7A3C 3802	01570	JR	C,HEX6
79E2 00	01146	NOP		7A3E D607	01580	SUB	7
79E3 CD8879	01150	CALL	CHKSPC	7A40 4F	01590	HEX6 LD	C,A
79E6 FE26	01160	CP	','	7A41 F1	01600	POP	AF
79E8 2009	01170	JR	NZ,LDEC	7A42 81	01610	ADD	A,C
79EA CD167A	01180	CALL	HEX4	7A43 12	01620	LD	(DE),A
79ED ED5B497A	01190	LD	DE,(HEXLSB)	7A44 1B	01630	DEC	DE
79F1 1809	01200	JR	PROC	7A45 10D8	01640	DJNZ	PROG1
79F3 CD3723	01210	LDEC CALL	2337H	7A47 23	01650	INC	HL
79F6 E5	01220	PUSH	HL	7A48 C9	01660	RET	
79F7 CD4B7A	01230	CALL	BINARY	7A49 00	01670	HEXLSB DEFB	0
79FA EB	01240	EX	DE,HL	7A4A 00	01680	HEXMSB DEFB	0
79FB E1	01250	POP	HL	7A4B 3AAF40	01690	BINARY LD	A,(40AFH)
79FC ED53A440	01260	PROC LD	(16548),DE	7A4E FE02	01700	CP	2
7A00 1B	01270	DEC	DE	7A50 2820	01710	JR	Z,INT
7A01 AF	01280	XOR	A	7A52 FE03	01720	CP	3
7A02 12	01290	LD	(DE),A	7A54 CAF80A	01730	JP	Z,0AF8H
7A03 CD8879	01300	CALL	CHKSPC	7A57 3A2441	01740	LD	A,(4124H)

Listing 1 continued

ry. It's much faster than using For... Next loops and data statements. Other uses include setting memory to zero and whiting-out the screen.

CMD DELETE is simple to understand since it requires no returns or operands. It simply removes all unnecessary spaces and line feeds from completed Basic programs. This sort of compression saves memory and tape, and speeds up program execution.

In Level II Basic, the Restore command sets the data pointer to the first data statements, letting a program use the same data again. Although this is useful, CMD RESTORE 10,5 gives you control of the pointer and allows you to set it to the data statement you want.

The first parameter sets the data pointer at the beginning of line 10; the second parameter sets the data pointer to the fifth bit of data in line 10. For example:

```
10 DATA 1,2,3,4,5,6
20 CMD RESTORE 10,4
30 READ A:PRINT A
```

This short program prints the num-

ber 4 on the screen. As with the other commands, CMD Restore supports expressions. This command doesn't permit hexadecimal positions greater than 255. CMD RESTORE 100,300 is illegal since it specifies a position in line 100 that exceeds the limits of the command.

CMD SOUND &0642,191,191,191, 65 lets your computer emit simple sounds through an amplifier hooked up to the cassette jack. The Sound command's syntax is exactly the same as that of CMD Put, except that the parameters stand for different things.

The first parameter follows SOUND (in hexadecimal) and represents the durations of the subsequent four notes. Durations can last from 1 to 65535, and you can express them with either decimal or hexadecimal values. Here, too, you can use variables as long as they are within the prescribed range. The higher the numerical value of the duration, the longer each of the notes plays.

The next four values decimally represent the notes and can range from zero to 255. CMD SOUND 275, &3C

FF AD 08 65 6F is also legal. This command has a duration of 275 decimal and plays the notes 3C, FF, AD, 08, 65, and 6F hex.

All hexadecimal notes must be in groups of two characters. Variables represent either the duration or the notes, as long as they don't exceed the specified ranges.

Precautions

After you use the CMD Renew command, run the restored program before you do anything else. This fixes several of the variable pointer tables necessary for the correct operation of many other commands. Failure to take this required step results in crashes and hang-ups.

A word of warning: This program is unforgiving concerning syntax errors. Unlike Level II Basic, the error messages are not comprehensive. Go back to the rules for answers to persistent errors. ■

Write to Robert Milazzo at 3604 Lighthouse Ave., Las Vegas, NV 89110.

Listing 1 continued

7A5A FE90	01750	CP	144	7AB9 B7	02190	OR	A
7A5C 2805	01760	JR	Z,BINARI	7ABA C8	02200	RET	Z
7A5E 3812	01770	JR	C,INT	7ABB FD23	02210	INC	IY
7A60 C3B207	01780	JP	7B2H	7ABD 18ED	02220	JR	PUTSTR
7A63 3A2141	01790	LD	A,(4121H)	7ABF CD3723	02230	CALL	2337H
7A66 B7	01800	OR	A	7AC2 E5	02240	PUSH	HL
7A67 C2B207	01810	JP	NZ,7B2H	7AC3 CD7F0A	02250	CALL	0A7FH
7A6A 2A2241	01820	LD	HL,(4122H)	7AC6 7C	02260	LD	A,H
7A6D 110080	01830	LD	DE,32768	7AC7 B7	02270	OR	A
7A70 19	01840	ADD	HL,DE	7AC8 C24A1E	02280	JP	NZ,1E4AH
7A71 C9	01850	RET		7ACB FD7500	02290	LD	(IY+0),L
7A72 CD7F0A	01860	CALL	0A7FH	7ACE E1	02300	POP	HL
7A75 C9	01870	RET		7ACF 7E	02310	LD	A,(HL)
7A76 00	01880	PUT		7AD0 FE3A	02320	CP	' :
7A77 CD8879	01890	CALL	CHKSPC	7AD2 C8	02330	RET	Z
7A7A FE26	01900	CP	'&'	7AD3 B7	02340	OR	A
7A7C 2011	01910	JR	NZ,PUTDEC	7AD4 C8	02350	RET	Z
7A7E CD167A	01920	CALL	HEX4	7AD5 FE2C	02360	CP	' ,
7A81 FD2A497A	01930	LD	IY,(HEXLSB)	7AD7 C29719	02370	JP	NZ,1997H
7A85 CD8879	01940	CALL	CHKSPC	7ADA FD23	02380	INC	IY
7A88 FE2C	01950	CP	' ,	7ADC 23	02390	INC	HL
7A8A 2814	01960	JR	Z,PUT2	7ADD 18E0	02400	JR	PUTNUM
7A8C C39719	01970	JP	1997H	7ADF 2AF940	02410	LD	HL,(16633)
7A8F CD3723	01980	CALL	2337H	7AE2 ED4BA440	02420	LD	BC,(16548)
7A92 E5	01990	PUSH	HL	7AE6 03	02430	INC	BC
7A93 7E	02000	LD	A,(HL)	7AE7 03	02440	INC	BC
7A94 FE2C	02010	CP	' ,	7AE8 03	02450	INC	BC
7A96 C29719	02020	JP	NZ,1997H	7AE9 03	02460	INC	BC
7A99 CD4B7A	02030	CALL	BINARY	7AEA C5	02470	PUSH	BC
7A9C E5	02040	PUSH	HL	7AEB D1	02480	POP	DE
7A9D FDE1	02050	POP	IY	7AEC B7	02490	OR	A
7A9F E1	02060	POP	HL	7AED ED42	02500	SBC	HL,BC
7AA0 23	02070	PUT2		7AEF E5	02510	PUSH	HL
7AA1 CD8879	02080	CALL	CHKSPC	7AF0 C1	02520	POP	BC
7AA4 FE26	02090	CP	'&'	7AF1 D5	02530	PUSH	DE
7AA6 2017	02100	JR	NZ,PUTNUM	7AF2 E1	02540	POP	HL
7AA8 23	02110	INC	HL	7AF3 03	02550	INC	BC
7AA9 CD8879	02120	CALL	CHKSPC	7AF4 7E	02560	LD	A,(HL)
7AAC CDE07B	02130	CALL	HEXSTR	7AF5 FE0A	02570	CP	10
7AAF FD7700	02140	LD	(IY+0),A	7AF7 CC407B	02580	CALL	Z,D4
7AB2 23	02150	INC	HL	7AFA FE20	02590	CP	32
7AB3 CD8879	02160	CALL	CHKSPC	7AFC CC407B	02600	CALL	Z,D4
7AB6 FE3A	02170	CP	' ,	7AFF FE22	02610	CP	34
7AB8 C8	02180	RET	Z	7B01 CC227B	02620	CALL	Z,D1

Listing 1 continued

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Listing 1 continued

7B04 FE88	02630	CP	136	7B87 ED53FF40	03470	RESTEN	LD	(16639),DE
7B06 CC397B	02640	CALL	Z,D3	7B8B 7E	03480		LD	A,(HL)
7B09 FE93	02650	CP	147	7B8C FE3A	03490		CP	':'
7B0B CC397B	02660	CALL	Z,D3	7B8E C8	03500		RET	Z
7B0E B7	02670	OR	A	7B8F B7	03510		OR	A
7B0F CC2E7B	02680	CALL	Z,D2	7B90 C8	03520		RET	Z
7B12 EDA0	02690	LDI		7B91 C39719	03530		JP	1997H
7B14 EAF47A	02700	JP	PE,DLOOP	7B94 00	03540	DELAY	NOP	
7B17 CDF81A	02710	CALL	1AF8H	7B95 23	03550		INC	HL
7B1A 23	02720	INC	HL	7B96 23	03560		INC	HL
7B1B 23	02730	INC	HL	7B97 23	03570		INC	HL
7B1C 22F940	02740	LD	(16633),HL	7B98 23	03580		INC	HL
7B1F C3EF1A	02750	JP	1AEFH	7B99 AF	03590		XOR	A
7B22 EDA0	02760	LDI		7B9A 321742	03600		LD	(16919),A
7B24 7E	02770	LD	A,(HL)	7B9D CD1C2B	03610		CALL	2B1CH
7B25 B7	02780	OR	A	7BA0 FE3C	03620		CP	60
7B26 CA4A1E	02790	JP	Z,1E4AH	7BA2 D24A1E	03630		JP	NC,1E4AH
7B29 FE22	02800	CP	''	7BA5 47	03640		LD	B,A
7B2B 20F5	02810	JR	NZ,D1	7BA6 3A1742	03650	DELAY1	LD	A,(16919)
7B2D C9	02820	RET		7BA9 B8	03660		CP	B
7B2E EDA0	02830	LDI		7BAA C8	03670		RET	Z
7B30 EDA0	02840	LDI		7BAB 3A4038	03680		LD	A,(3840H)
7B32 EDA0	02850	LDI		7BAE FE04	03690		CP	4
7B34 EDA0	02860	LDI		7BB0 C8	03700		RET	Z
7B36 E8	02870	RET	PE	7BB1 18F3	03710		JR	DELAY1
7B37 03	02880	INC	BC	7BB3 23	03720	HIMEM	INC	HL
7B38 C9	02890	RET		7BB4 23	03730		INC	HL
7B39 EDA0	02900	LDI		7BB5 23	03740		INC	HL
7B3B 7E	02910	LD	A,(HL)	7BB6 00	03745		NOP	
7B3C B7	02920	OR	A	7BB7 00	03746		NOP	
7B3D 20FA	02930	JR	NZ,D3	7BB8 CD8879	03750		CALL	CHKSPC
7B3F C9	02940	RET		7BBB FE26	03760		CP	'&'
7B40 23	02950	INC	HL	7BBD 2016	03770		JR	NZ,HINUM
7B41 0B	02960	DEC	BC	7BBF CD167A	03780		CALL	HEX4
7B42 7E	02970	LD	A,(HL)	7BC2 ED5B497A	03790		LD	DE,(HEXLSB)
7B43 FE20	02980	CP	32	7BC6 ED53B140	03800	HIEND	LD	(16561),DE
7B45 28F9	02990	JR	Z,D4	7BCA CD8879	03810		CALL	CHKSPC
7B47 FE0A	03000	CP	10	7BCD FE3A	03820		CP	':'
7B49 28F5	03010	JR	Z,D4	7BCF C8	03830		RET	Z
7B4B C9	03020	RET		7BD0 B7	03840		OR	A
7B4C CD3723	03030	CALL	2337H	7BD1 C8	03850		RET	Z
7B4F E5	03040	PUSH	HL	7BD2 C39719	03860		JP	1997H
7B50 CD4B7A	03050	CALL	BINARY	7BD5 CD3723	03870	HINUM	CALL	2337H
7B53 EB	03060	EX	DE,HL	7BD8 E5	03880		PUSH	HL
7B54 CD2C1B	03070	CALL	1B2CH	7BD9 CD4B7A	03890		CALL	BINARY
7B57 D24A1E	03080	JP	NC,1E4AH	7BDC EB	03900		EX	DE,HL
7B5A E1	03090	POP	HL	7BDD E1	03910		POP	HL
7B5B 0B	03095	DEC	BC	7BDE 18E6	03920		JR	HIEND
7B5C C5	03100	PUSH	BC	7BE0 7E	03930	HEXSTR	LD	A,(HL)
7B5D CF	03110	RST	8	7BE1 D630	03940		SUB	30H
7B5E 2C	03120	DEFB	','	7BE3 FE0A	03950		CP	10
7B5F CD3723	03130	CALL	2337H	7BE5 3807	03960		JR	C,HEXNUM
7B62 E5	03140	PUSH	HL	7BE7 FE11	03970		CP	11H
7B63 CD7F0A	03150	CALL	0A7FH	7BE9 DA4A1E	03980		JP	C,1E4AH
7B66 7C	03160	LD	A,H	7BEC D607	03990		SUB	7
7B67 B7	03170	OR	A	7BEE CB27	04000	HEXNUM	SLA	A
7B68 C24A1E	03180	JP	NZ,1E4AH	7BF0 CB27	04010		SLA	A
7B6B 7D	03190	LD	A,L	7BF2 CB27	04020		SLA	A
7B6C E1	03200	POP	HL	7BF4 CB27	04030		SLA	A
7B6D D1	03210	POP	DE	7BF6 47	04040		LD	B,A
7B6E B7	03220	OR	A	7BF7 23	04050		INC	HL
7B6F 2816	03230	JR	Z,RESTEN	7BF8 CD8879	04060		CALL	CHKSPC
7B71 FE01	03240	CP	1	7BF9 B7	04070		OR	A
7B73 2812	03250	JR	Z,RESTEN	7BFC CA4A1E	04080		JP	Z,1E4AH
7B75 3D	03280	DEC	A	7BFF FE3A	04090		CP	':'
7B76 47	03290	LD	B,A	7C01 CA4A1E	04100		JP	Z,1E4AH
7B77 13	03300	INC	DE	7C04 D630	04110		SUB	30H
7B78 13	03310	INC	DE	7C06 FE0A	04120		CP	10
7B79 13	03320	INC	DE	7C08 3807	04130		JR	C,HEXNU2
7B7A 13	03330	INC	DE	7C0A FE11	04140		CP	11H
7B7B 13	03400	INC	DE	7C0C DA4A1E	04150		JP	C,1E4AH
7B7C 1A	03410	LD	A,(DE)	7C0F D607	04160		SUB	7
7B7D B7	03420	OR	A	7C11 80	04170	HEXNU2	ADD	A,B
7B7E CA4A1E	03430	JP	Z,1E4AH	7C12 C9	04180		RET	
7B81 FE2C	03440	CP	''	0000	04190		END	
7B83 20F6	03450	JR	NZ,REST3	00000	Total Errors			
7B85 10F4	03460	DJNZ	REST3					

End

Program Listing 2. Basic Plus, Part 2.

```

7C1B      00100      ORG      7C1BH
          00110      ;PROGRAM LISTING 2
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7988      00160      CHKSPC      EQU      7988H
7A16      00170      HEX4        EQU      7A16H
7A49      00180      HEXLSB      EQU      7A49H
7A4B      00190      BINARY      EQU      7A4BH
7BE0      00200      HEXSTR      EQU      7BE0H
7C1B 23   00210      SOUND      INC      HL
7C1C 23   00220      INC        HL
7C1D 23   00230      INC        HL
7C1E 23   00240      INC        HL
7C1F CD8879 00250      CALL      CHKSPC

```

Listing 2 continued



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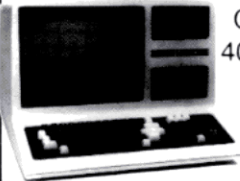
Listing 2 continued

7C22 FE26	00260	CP	'&'	7D46 ED53407F	01220	LD	(IYVAL) .DE
7C24 203C	00270	JR	NZ,SONDEC	7D4A AF	01230	XOR	A
7C26 CD167A	00280	CALL	HEX4	7D4B 32427F	01240	LD	(AVAL) ,A
7C29 00	00290	NOP		7D4E CD8879	01250	CALL	CHKSPC
7C2A CF	00300	RST	8	7D51 FE26	01260	CP	'&'
7C2B 2C	00310	DEFB	' , '	7D53 200D	01270	JR	NZ,USNRUM
7C2C ED5B497A	00320	LD	DE, (HEXLSB)	7D55 CD167A	01280	CALL	HEX4
7C30 ED538A7C	00330	LD	(DURAT) .DE	7D58 ED5B497A	01290	LD	DE, (HEXLSB)
7C34 CD8879	00340	CALL	CHKSPC	7D5C ED531E7E	01300	LD	(USRJUM) ,DE
7C37 FE26	00350	CP	'&'	7D60 180B	01310	JR	TOVAR
7C39 2816	00360	JR	Z,SONHEX	7D62 CD3723	01320	USNRUM CALL	2337H
7C3B CD3723	00370	SONNUM CALL	2337H	7D65 E5	01330	PUSH	HL
7C3E E5	00380	PUSH	HL	7D66 CD4B7A	01340	CALL	BINARY
7C3F CD7F0A	00390	CALL	0A7FH	7D69 221E7E	01350	LD	(USRJUM) ,HL
7C42 7D	00400	LD	A, L	7D6C E1	01360	POP	HL
7C43 E1	00410	POP	HL	7D6D CD8879	01370	TOVAR CALL	CHKSPC
7C44 CD717C	00420	CALL	SOUND1	7D70 FE3A	01380	CP	'&'
7C47 7E	00430	LD	A, (HL)	7D72 CA047E	01390	JP	Z,USREND
7C48 FE3A	00440	CP	'&'	7D75 G7	01400	OR	A
7C4A C8	00450	RET	Z	7D76 CA047E	01410	JP	Z,USREND
7C4B B7	00460	OR	A	7D79 FE92	01420	CP	146
7C4C C8	00470	RET	Z	7D7B CA047E	01430	JP	Z,USREND
7C4D CF	00480	RST	8	7D7E CF	01440	RST	8
7C4E 2C	00490	DEFB	' , '	7D7F 2C	01450	DEFB	' , '
7C4F 18EA	00500	JR	SONNUM	7D80 CD8879	01460	CALL	CHKSPC
7C51 23	00510	INC	HL	7D83 FE48	01470	CP	'&'
7C52 CD8879	00520	CALL	CHKSPC	7D85 2813	01480	JR	Z,USRHL
7C55 FE3A	00530	CP	'&'	7D87 FE42	01490	CP	'B'
7C57 C8	00540	RET	Z	7D89 2827	01500	JR	Z,USRBC
7C58 B7	00550	OR	A	7D8B FE44	01510	CP	'D'
7C59 C8	00560	RET	Z	7D8D 2817	01520	JR	Z,USRDE
7C5A CDE07B	00570	CALL	HEXSTR	7D8F FE41	01530	CP	'A'
7C5D CD717C	00580	CALL	SOUND1	7D91 282B	01540	JR	Z,USRA
7C60 18EF	00590	JR	SONHEX	7D93 FE49	01550	CP	'I'
7C62 CD3723	00600	CALL	2337H	7D95 2831	01560	JR	Z,USRI
7C65 E5	00610	PUSH	HL	7D97 C39719	01570	JP	1997H
7C66 CD4B7A	00620	CALL	BINARY	7D9A 23	01580	USRHL INC	HL
7C69 228A7C	00630	LD	(DURAT) ,HL	7D9B CF	01590	RST	8
7C6C E1	00640	POP	HL	7D9C 4C	01600	DEFB	'L'
7C6D CF	00650	RST	8	7D9D QDE97D	01610	CALL	USRVAL
7C6E 2C	00660	DEFB	' , '	7DA0 ED53387F	01620	LD	(HLVAL) ,DE
7C6F 18C3	00670	JR	SONCON	7DA4 18C7	01630	JR	TOVAR
7C71 4F	00680	LD	C, A	7DA6 23	01640	USRDE INC	HL
7C72 ED5B8A7C	00690	LD	DE, (DURAT)	7DA7 CF	01650	RST	8
7C76 47	00700	LD	B, A	7DA8 45	01660	DEFB	'E'
7C77 3E01	00710	LD	A, 1	7DA9 CDE97D	01670	CALL	USRVAL
7C79 D3FF	00720	OUT	(255) ,A	7DAC ED533A7F	01680	LD	(DEVAL) ,DE
7C7B 10FE	00730	SON2 DJNZ	SON2	7DB0 18BB	01690	JR	TOVAR
7C7D 41	00740	LD	B, C	7DB2 23	01700	USRBC INC	HL
7C7E 3C	00750	INC	A	7DB3 CF	01710	RST	8
7C7F D3FF	00760	OUT	(255) ,A	7DB4 43	01720	DEFB	'C'
7C81 10FE	00770	SON3 DJNZ	SON3	7DB5 CDE97D	01730	CALL	USRVAL
7C83 1B	00780	DEC	DE	7DB8 ED533C7F	01740	LD	(BCVAL) ,DE
7C84 7A	00790	LD	A, D	7DBC 18AF	01750	JR	TOVAR
7C85 B3	00800	OR	E	7DBE 23	01760	USRA INC	HL
7C86 C8	00810	RET	Z	7DBF CDE97D	01770	CALL	USRVAL
7C87 79	00820	LD	A, C	7DC2 7B	01780	LD	A, E
7C88 18EC	00830	JR	SON1	7DC3 32427F	01790	LD	(AVAL) ,A
7C8A 0000	00840	DURAT DEFW	0000	7DC6 18A5	01800	JR	TOVAR
7C8C E5	00850	SAVE PUSH	HL	7DC8 23	01810	USRI INC	HL
7C8D 2AA440	00860	LD	HL, (16548)	7DC9 CD8879	01820	CALL	CHKSPC
7C90 11CB7C	00870	LD	DE, BUFFER	7DCC FE58	01830	CP	'X'
7C93 016400	00880	LD	BC, 100	7DCE 23	01840	INC	HL
7C96 EDB0	00890	LDIF		7DCF 280E	01850	JR	Z,USRX
7C98 2AF940	00900	LD	HL, (40F9H)	7DD1 FE59	01860	CP	'Y'
7C9B 22317D	00910	LD	(SAVEND) ,HL	7DD3 C29719	01870	JP	NZ,1997H
7C9E E1	00920	POP	HL	7DD6 CDE97D	01880	CALL	USRVAL
7C9F CD8879	00930	CALL	CHKSPC	7DD9 ED53407F	01890	LD	(IYVAL) ,DE
7CA2 FE3A	00940	CP	'&'	7DDD 188E	01900	JR	TOVAR
7CA4 C8	00950	RET	Z	7DDF CDE97D	01910	USRX CALL	USRVAL
7CA5 B7	00960	OR	A	7DE2 ED533E7F	01920	LD	(IXVAL) ,DE
7CA6 C8	00970	RET	Z	7DE6 C36D7D	01930	JP	TOVAR
7CA7 C39719	00980	JP	1997H	7DE9 CF	01940	USRVAL RST	8
7CAA 23	00990	INC	HL	7DEA D5	01950	DEFB	213
7CAB 23	01000	INC	HL	7DEB CD8879	01960	CALL	CHKSPC
7CAC E5	01010	PUSH	HL	7DEE FE26	01970	CP	'&'
7CAD 21CB7C	01020	LD	HL, BUFFER	7DF0 2008	01980	JR	NZ,USRDEC
7CB0 ED5BA440	01030	LD	DE, (16548)	7DF2 CD167A	01990	CALL	HEX4
7CB4 016400	01040	LD	BC, 100	7DF5 ED5B497A	02000	LD	DE, (HEXLSB)
7CB7 EDB0	01050	LDIR		7DF9 C9	02010	RET	
7CB9 2A317D	01060	LD	HL, (SAVEND)	7DFA CD3723	02020	USRDEC CALL	2337H
7CBC 22F940	01070	LD	(40F9H) ,HL	7DFD E5	02030	PUSH	HL
7CBF E1	01080	POP	HL	7DFE CD4B7A	02040	CALL	BINARY
7CC0 CD8879	01090	CALL	CHKSPC	7E01 EB	02050	EX	DE, HL
7CC3 FE3A	01100	CP	'&'	7E02 E1	02060	POP	HL
7CC5 C8	01110	RET	Z	7E03 C9	02070	RFT	
7CC6 B7	01120	OR	A	7E04 22437F	02080	USREND LD	(POSIT) ,HL
7CC7 C8	01130	RET	Z	7E07 2A387F	02090	LD	HL, (HLVAL)
7CC8 C39719	01140	JP	1997H	7E0A ED4B3C7F	02100	LD	BC, (BCVAL)
0066	01150	DEFB	102	7E0E ED5B3A7F	02110	LD	DE, (DEVAL)
7D31 0000	01160	SAVEND DEFW	0000	7E12 DD2A3E7F	02120	LD	IX, (IXVAL)
7D33 110000	01170	USR LD	DE, 0	7E16 FD2A407F	02130	LD	IY, (IYVAL)
7D36 ED53387F	01180	LD	(HLVAL) ,DE	7E1A 3A427F	02140	LD	A, (AVAL)
7D3A ED533A7F	01190	LD	(DEVAL) ,DE	7E1D CD	02150	DEFB	0CDH
7D3E ED533C7F	01200	LD	(BCVAL) ,DE	7E1E 00	02160	USRJUM DEFB	0
7D42 ED533E7F	01210	LD	(IXVAL) ,DE	7E1F 00	02170	DEFB	0

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7E20 22387F	02180	LD	(HLVAL),HL	7EDC 23	03120	INC	HL
7E23 ED533A7F	02190	LD	(DEVAL),DE	7EDD CD8879	03130	CALL	CHKSPC
7E27 ED433C7F	02200	LD	(BCVAL),BC	7EE0 B7	03140	OR	A
7E2B DD223E7F	02210	LD	(IXVAL),IX	7EE1 C8	03150	RET	Z
7E2F FD22407F	02220	LD	(IYVAL),IY	7EE2 FE3A	03160	CP	','
7E33 32427F	02230	LD	(AVAL),A	7EE4 C8	03170	RET	Z
7E36 2A437F	02240	LD	HL,(POSIT)	7EE5 CF	03180	RST	8
7E39 7E	02250	LD	A,(HL)	7EE6 2C	03190	DEFB	','
7E3A FE3A	02260	CP	','	7EE7 C3417E	03200	JP	RETVAR
7E3C C8	02270	RET	Z	7EEA ED4B3E7F	03210	LD	BC,(IXVAL)
7E3D B7	02280	OR	A	7EEE CDF7E	03220	CALL	TRANVR
7E3E C8	02290	RET	Z	7EF1 23	03230	INC	HL
7E3F CF	02300	RST	8	7EF2 CD8879	03240	CALL	CHKSPC
7E40 92	02310	DEFB	146	7EF5 B7	03250	OR	A
7E41 CD8879	02320	CALL	CHKSPC	7EF6 C8	03260	RET	Z
7E44 CD0D26	02330	CALL	260DH	7EF7 FE3A	03270	CP	','
7E47 3AAF40	02340	LD	A,(40AFH)	7EF9 C8	03280	RET	Z
7E4A FE04	02350	CP	4	7EFA CF	03290	RST	8
7E4C C24A1E	02360	JP	NZ,1E4AH	7EFB 2C	03300	DEFB	','
7E4F ED53457F	02370	LD	(VARLOC),D	7EFC C3417E	03310	JP	RETVAR
7E53 CF	02380	RST	8	7EFF CB78	03320	BIT	7,B
7E54 D5	02390	DEFB	213	7F01 281C	03330	JR	Z,UNDOV
7E55 CD8879	02400	CALL	CHKSPC	7F03 CBB8	03340	RES	7,B
7E58 FE48	02410	CP	'H'	7F05 3E90	03350	LD	A,144
7E5A 2813	02420	JR	Z,HLRET	7F07 322441	03360	LD	(4124H),A
7E5C FE42	02430	CP	'B'	7F0A ED432241	03370	LD	(4122H),BC
7E5E 283B	02440	JR	Z,BCRET	7F0E AF	03380	XOR	A
7E60 FE44	02450	CP	'D'	7F0F 322141	03390	LD	(4121H),A
7E62 2821	02460	JR	Z,DERET	7F12 E5	03400	PUSH	HL
7E64 FE49	02470	CP	'I'	7F13 212141	03410	LD	HL,4121H
7E66 2860	02480	JR	Z,IRET	7F16 ED5B457F	03420	LD	DE,(VARLOC)
7E68 FE41	02490	CP	'A'	7F1A CD8B7F	03430	CALL	MOVE
7E6A 2845	02500	JR	Z,ARET	7F1D E1	03440	POP	HL
7E6C C39719	02510	JP	1997H	7F1E C9	03450	RET	
7E6F 23	02520	HLRET	INC	7F1F ED432141	03460	UNDOV	LD (4121H),BC
7E70 CF	02530	RST	8	7F23 E5	03470	PUSH	HL
7E71 4C	02540	DEFB	'L'	7F24 3E02	03480	LD	A,2
7E72 ED4B387F	02550	LD	BC,(HLVAL)	7F26 32AF40	03490	LD	(40AFH),A
7E76 CDF7E	02560	CALL	TRANVR	7F29 CDB10A	03500	CALL	0AB1H
7E79 CD8879	02570	CALL	CHKSPC	7F2C 212141	03510	LD	HL,4121H
7E7C B7	02580	OR	A	7F2F ED5B457F	03520	LD	DE,(VARLOC)
7E7D C8	02590	RET	Z	7F33 CD8B7F	03530	CALL	MOVE
7E7E FE3A	02600	CP	','	7F36 E1	03540	POP	HL
7E80 C8	02610	RET	Z	7F37 C9	03550	RET	
7E81 CF	02620	RST	8	7F38 0000	03560	HLVAL	DEFW 0000
7E82 2C	02630	DEFB	','	7F3A 0000	03570	DEVAL	DEFW 0000
7E83 18BC	02640	JR	RETVAR	7F3C 0000	03580	BCVAL	DEFW 0000
7E85 23	02650	INC	HL	7F3E 0000	03590	IXVAL	DEFW 0000
7E86 CF	02660	RST	8	7F40 0000	03600	IYVAL	DEFW 0000
7E87 45	02670	DEFB	'E'	7F42 00	03610	AVAL	DEFB 0
7E88 ED4B3A7F	02680	LD	BC,(DEVAL)	7F43 0000	03620	POSIT	DEFW 0
7E8C CDF7E	02690	CALL	TRANVR	7F45 0000	03630	VARLOC	DEFW 0
7E8F CD8879	02700	CALL	CHKSPC	7F47 00	03640	GET	NOP
7E92 B7	02710	OR	A	7F48 CD8879	03650	CALL	CHKSPC
7E93 C8	02720	RET	Z	7F4B FE26	03660	CP	'&'
7E94 FE3A	02730	CP	','	7F4D 2009	03670	JR	NZ,GETDEC
7E96 C8	02740	RET	Z	7F4F CD167A	03680	CALL	HEX4
7E97 CF	02750	RST	8	7F52 ED5B497A	03690	LD	DE,(HEXLSB)
7E98 2C	02760	DEFB	','	7F56 1809	03700	JR	GET1
7E99 18A6	02770	JR	RETVAR	7F58 CD3723	03710	CALL	2337H
7E9B 23	02780	INC	HL	7F5B E5	03720	PUSH	HL
7E9C CF	02790	RST	8	7F5C CD4B7A	03730	CALL	BINARY
7E9D 43	02800	DEFB	'C'	7F5F EB	03740	EX	DE,HL
7E9E ED4B3C7F	02810	LD	BC,(BCVAL)	7F60 E1	03750	POP	HL
7EA2 CDF7E	02820	CALL	TRANVR	7F61 1A	03760	GET1	LD A,(DE)
7EA5 CD8879	02830	CALL	CHKSPC	7F62 4F	03770	LD	C,A
7EA8 B7	02840	OR	A	7F63 13	03780	INC	DE
7EA9 C8	02850	RET	Z	7F64 1A	03790	LD	A,(DE)
7EAA FE3A	02860	CP	','	7F65 47	03800	LD	B,A
7EAC C8	02870	RET	Z	7F66 CF	03810	GETV	RST 8
7EAD CF	02880	RST	8	7F67 2C	03820	DEFB	','
7EAE 2C	02890	DEFB	','	7F68 CD8879	03830	CALL	CHKSPC
7EAF 1890	02900	JR	RETVAR	7F6B C5	03840	PUSH	BC
7EB1 23	02910	INC	HL	7F6C CD0D26	03850	CALL	260DH
7EB2 3A427F	02920	LD	A,(AVAL)	7F6F 3AAF40	03860	LD	A,(40AFH)
7EB5 4F	02930	LD	C,A	7F72 FE04	03870	CP	4
7EB6 0600	02940	LD	B,0	7F74 C24A1E	03880	JP	NZ,1E4AH
7EB8 CDF7E	02950	CALL	TRANVR	7F77 C1	03890	POP	BC
7EBB CD8879	02960	CALL	CHKSPC	7F78 ED53457F	03900	LD	(VARLOC),DE
7EBE B7	02970	OR	A	7F7C C5	03910	PUSH	BC
7EBF C8	02980	RET	Z	7F7D CDF7E	03920	CALL	TRANVR
7EC0 FE3A	02990	CP	','	7F80 C1	03930	POP	BC
7EC2 C8	03000	RET	Z	7F81 CD8879	03940	CALL	CHKSPC
7EC3 CF	03010	RST	8	7F84 FE3A	03950	CP	','
7EC4 2C	03020	DEFB	','	7F86 C8	03960	RET	Z
7EC5 C3417E	03030	JP	RETVAR	7F87 B7	03970	OR	A
7EC8 23	03040	INC	HL	7F88 C8	03980	RET	Z
7EC9 CD8879	03050	CALL	CHKSPC	7F89 18DB	03990	JR	GETV
7ECC FE58	03060	CP	'X'	7F8B 010400	04000	MOVE	LD BC,4
7ECE 281A	03070	JR	Z,XRET	7F8E EDB0	04010	LDIR	
7ED0 FE59	03080	CP	'Y'	7F90 C9	04020	RET	
7ED2 C29719	03090	JP	NZ,1997H	0000	04030	END	
7ED5 ED4B407F	03100	LD	BC,(IYVAL)	00000 Total Errors			
7ED9 CDF7E	03110	CALL	TRANVR				

End

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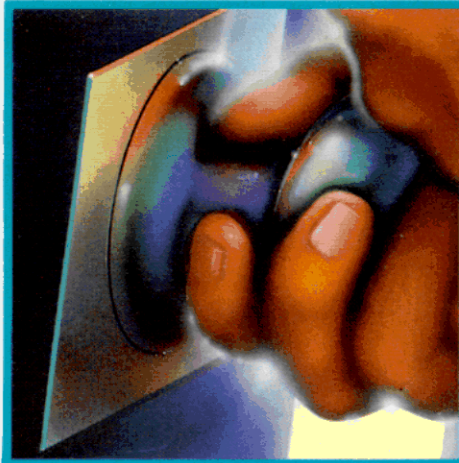
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Facilitate Basic program maintenance with these 11 commands—they let you manipulate program strings and lines and recover programs erased by the New command.

Basic Changes

by Raymond Boggs

My Finder utility does for Basic programs what a word processor does for text; it makes manipulating lines and strings easier and faster.

Finder provides 11 commands that let you locate specific strings within a Basic program; edit the line last displayed; copy, move, or replace a line; and, under most circumstances, restore all but the first few lines of a program accidentally erased from memory by the New command (see the Table).

When you run Finder from Basic, you'll have full access to both Basic and Finder commands. The dollar sign prompt (\$) reminds you when you're under Finder's control. It's important to remember to exit Finder before actually running the program on which you're working.

The Commands

You should add a period after all Finder commands to delimit their area of operation. The Find String command, F, locates any string within the text of a Basic program. You must include a period after F to search for a specified string from the beginning of a program; without the period, the statement searches for the string starting at the most recently displayed line.

When Finder finishes its search, it displays an "End of Text" message, along with the number of matches found. Finder accepts a maximum string length of 31 characters; it truncates any string that exceeds this limit.

The second command, X, builds a cross-referenced table displaying the number of each line with a string that matches one you specify. This routine

sets a flag for the Find String command, forcing it to print out only the line numbers. Control of the keyboard isn't returned to you until after X searches the entire program.

The Edit command (E) lets you edit the line last displayed by the Find String command. A special buffer saved for the E command points to the line containing the most recent match. The buffer lets you list any line of the text to edit with Finder's E command.

For example, suppose you delete all the remarks in your program, including one in line 1500. You have several GOSUB 1500 statements left in your program. To find and change them, first type in LIST 1500- to get to the first line after line 1500 in the program. Now you can use F.GOSUB 1500 to display the string where GOSUB 1500 first occurs. The E command lets you edit the line using Basic's line editor. Repeat the F and E commands until you've made all the necessary changes.

The next command, R, lets you replace one line with another. For example, R.100.150 replaces line 150 with an exact copy of line 100. For this to work, the program must contain an unaltered source line and you must specify a valid target line number.

The Copy command, C, copies an existing line to the desired destination. For example, C.100.150 copies line 100, which must exist, to line 150, which must not exist.

The Move command, M, moves a line from its present position to a new one. For example, M.100.150 moves line 100 to line 150, overwriting the old line 150 or creating a new line. Finder deletes line 100 after it completes the move.

The L command prints the current

line number, revealing the line to which the Finder buffer points. This is particularly useful when editing, as it tells you where you last left off.

The S command tells you the string for which you're currently searching, while the N command gives you the number of matches found thus far. Note that Finder resets the match counter after it locates the last match.

The Unnew command, U, restores a program that you erased with Basic's New command. Use the U command immediately after your mistake, as any program lines entered subsequently prevent Unnew from working. The U command is most effective if you start your program with a remark line full of asterisks.

Unnew can save all but the first 15 bytes of your program, part of which are line numbers and the linked list pointers that Basic uses. Before running your program, remember to save it under a different file name, restore the REM line of asterisks, and load it into memory. If you've made Finder part of your operating system with the SYSGEN command, Unnew should work even if you're not using Finder at that particular time. One warning—if your computer starts to make wild disk accesses, immediately press the orange reset button.

The final command, Q, takes you out of Finder and back into Basic.

The Key Box



Model 4
64K RAM
Disk Basic 01.00.00 or 01.01.00
Assembly Language
Editor/Assembler optional

Using Finder

I developed Finder with Radio Shack's Series I Editor/Assembler in Model III mode because no Model 4 editor/assemblers were available at the time. As a result, I've included three sets of instructions: The first set is for those of you using the Model III editor/assembler, the second set is for Model 4 editor/assemblers, and the final set applies to data statements that you can POKE in from Basic rather than using an editor/assembler.

For Series I Editor/Assemblers

Type in Program Listing 1, entering only the equates that apply to your version of Basic. Then type in A FIND,NL,NS to assemble the program to disk.

At TRSDOS Ready, type in CLEAR. Type in LOAD FIND/CMD to load the program into memory. Remove the Model III EDTASM disk and insert the proper TRSDOS 6.X.X system disk in drive zero.

While holding down the clear key, press and quickly release the reset button until you see the TRSDOS Ready prompt. This overrides anything that you've included in your system with the SYSGEN command.

At TRSDOS Ready, type in:

```
DUMP FIND/CMD:0 (START = X'FBC0',
END = X'FFFF',TRA = X'FBC0')
```

Then type in MEMORY (HIGH = X'FBBF'). This prevents any machine-language modules from overwriting Finder and makes it a permanent part of your operating system. Reestablish any filtering, linkage, or routing and type in SYSGEN.

For Model 4 Editor/Assemblers

Enter Program Listing 1 with only those equates that apply to your version of Basic. Assemble the program to disk. While holding down the clear key, press the reset button, overriding anything that you might have incorporated into your system with SYSGEN.

Type in MEMORY (CLEAR), then MEMORY (HIGH = X'FBBF'). Type in LOAD FIND/CMD. Reestablish any filtering, linkage, or routing and type in SYSGEN.

For Basic Data Statements

Boot up your system (TRSDOS 6.X.X) and get into Basic. Enter Pro-

gram Listing 2 (for Basic 01.00.00) or Program Listing 3 (for Basic 01.01.00) as appropriate.

Type in SAVE "FIND/BAS". While holding down the clear key, press the reset button. This overrides anything that you added to your system with SYSGEN.

Type in MEMORY (CLEAR). Type in MEMORY (HIGH = X'FBBF'). Type in BASIC FIND/BAS. At the Basic Ready prompt, type in SYSGEN. Reestablish all linkage, filtering, or routing and type in SYSGEN. Then type in:

```
DUMP FIND/CMD:0 (START = X'FBC0',
END = X'FFFF',TRA = X'FBC0')
```

Finder is now a permanent memory-resident program (as long as you don't hold the clear key down when

booting up). If you use this system disk when developing Basic programs, you'll always have access to Finder.

To transfer Finder to other system disks, copy Finder to the intended disk and boot it up. Follow all but the first two steps outlined in the instructions for other editor/assemblers. You can remove Finder from any disk, but be sure to keep an extra copy on a separate disk for security.

To run Finder, from Basic type in SYSTEM "RUN FIND". If you've removed Find/CMD from your system disk, type in FIND = &HFBC0 to define the entry point to Finder. Then type in CALL FIND to use the program. ■

Contact Raymond C. Boggs at 4735 Feigley Road S.W., Port Orchard, WA 98366.

Command

F.string

X.string

E

R.source.destination

C.source.destination

M.source.destination

L

S

N

U

Q

Definition

Finds string in Basic program.

Builds cross-reference table.

Edits line most recently displayed by F command.

Replaces source line number to destination line number.

Copies source line number to destination line number.

Moves source line number to destination line number.

Prints current line number.

Prints current search string.

Prints number of matches found.

Restores erased program.

Quits Finder.

Table. Finder's commands.

Program Listing 1. Source code for Finder.

```
00100 *****
00110 ;** NOTE: TWO SETS OF ADDRESSES ARE PROVIDED BELOW. **
00120 ;** THE PROPER SET TO USE DEPENDS ON THE **
00130 ;** VERSION OF BASIC ON YOUR COMPUTER. **
00140 ;** USE THE 1st SET WITH BASIC 01.00.00. **
00150 ;** USE THE 2nd SET WITH BASIC 01.01.00. **
00160 ;** BE SURE TO LEAVE OUT OR COMMENT OUT THE **
00170 ;** SET THAT DOESN'T APPLY TO YOUR VERSION. **
00180 *****
00190 ***** BASIC ROUTINE ADDRESSES *****
00200 ;** THESE ADDRESSES FOR USE WITH BASIC 01.00.00 ONLY. **
00210 *****
00220 * START BLOCK COMMENT OF UNUSED ADDRESSES BELOW. **
00230 ASCBIN EQU 6A69H ;CONVERT ASCII TO BINARY
00240 BINASC EQU 3139H ;BINARY TO ASCII & PRINT
00250 EDIT EQU 3D2BH ;BASIC LINE EDIT ROUTINE
00260 EXPAND EQU 769AH ;BASIC LIN EXPAND ROUTINE
00270 EXPANL EQU 769DH ;SAME AS EXPAND, EXCEPT..
00280 ;USER DEFINES BUFFR IN BC
00290 KBLINE EQU 7CEFH ;KEYBOARD INPUT ROUTINE
00300 PSTSRC EQU 6564H ;PST SEARCH ROUTINE
00310 READY EQU 63DDH ;1ST BASIC 'READY' ADDRESS
00320 READY1 EQU 63F8H ;2ND BASIC 'READY' ADDRESS
00330 VDLIN EQU 7691H ;PRINT LINE TERMINATED...
```

Listing 1 continued

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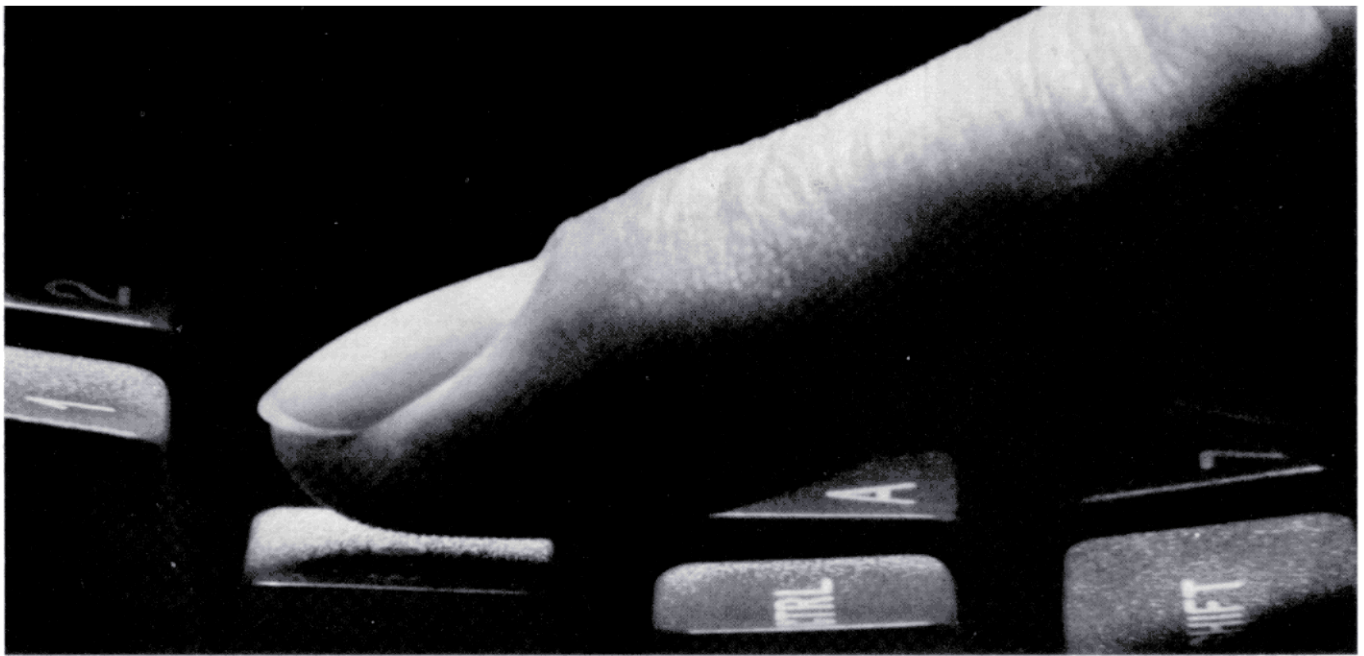
Listing 1 continued

```

00340 ;*****
00350 ;***** COMMUNICATIONS REGION ADDRESSES *****
00360 BASBUF EQU 5FB5H ;ADDRESS OF EXPANDED LINE
00370 BASEND EQU 611BH ;END OF BASIC PROGRAM PTR
00380 BASTRT EQU 5E1BH ;START ADDRESS OF PROGRAM
00390 BINBUF EQU 627CH ;BINASC CONVERSION BUFFER
00400 NOLINE EQU 5B77H ;NO SUCH LINE MESSAGE ADR
00410 AUTOLIN EQU 6104H ;CURRENT 'AUTO' LINE #
00420 AUTOFLG EQU 6103H ;AUTO INCREMENT FLAG
00430 AUTOINC EQU 6106H ;AUTO LINE INCREMENT
00440 ;*** ADDRESSES TO CHANGE TO TAKE CONTROL FROM BASIC ***
00450 JUMP1 EQU 6420H
00460 JUMP2 EQU 644EH
00470 OLDJMP EQU 7CEFH ;WHAT WAS IN THOSE AREAS
00480 ;*****
00490 NUM EQU 7FH ;CONSTANT FOR UNNEW
00500 * END BLOCK COMMENT.
00510 ;*****
00520 ;***** BASIC ROUTINE ADDRESSES *****
00530 ;** THESE ADDRESSES FOR USE WITH BASIC 01.01.00 ONLY. **
00540 ;*****
00550 ASCBIN EQU 5FB9H ;CONVERT ASCII TO BINARY
00560 BINASC EQU 3139H ;BINARY TO ASCII & PRINT
00570 EDIT EQU 3D2BH ;BASIC LINE EDIT ROUTINE
00580 EXPAND EQU 7A0DH ;BASIC LIN EXPAND ROUTINE
00590 EXPAN1 EQU 7A10H ;SAME AS EXPAND, EXCEPT..
00600 ;USER DEFINES BUFFER IN BC
00610 KBLINE EQU 7E1BH ;KEYBOARD INPUT ROUTINE
00620 PSTSRC EQU 5AB4H ;PST SEARCH ROUTINE
00630 READY EQU 5920H ;1ST BASIC 'READY' ADDRESS
00640 READY1 EQU 593BH ;2ND BASIC 'READY' ADDRESS
00650 VDLIN EQU 7A04H ;PRINT LINE TERMINATED...
00660 ;WITH BYTE OF 00H.
00670 ;***** COMMUNICATIONS REGION ADDRESSES *****
00680 BASBUF EQU 7039H ;ADDRESS OF EXPANDED LINE
00690 BASEND EQU 719FH ;END OF BASIC PROGRAM PTR
00700 BASTRT EQU 6E9EH ;START ADDRESS OF PROGRAM
00710 BINBUF EQU 72FFH ;BINASC CONVERSION BUFFER
00720 NOLINE EQU 6BE8H ;NO SUCH LINE MESSAGE ADR
00730 AU:OLIN EQU 7188H ;CURRENT 'AUTO' LINE #
00740 AUTOFLG EQU 7187H ;AUTO INCREMENT FLAG
00750 AUTOINC EQU 718AH ;AUTO LINE INCREMENT
00760 ;*** ADDRESSES TO CHANGE TO TAKE CONTROL FROM BASIC ***
00770 JUMP1 EQU 5963H
00780 JUMP2 EQU 5991H
00790 OLDJMP EQU 7E1BH ;WHAT WAS IN THOSE AREAS
00800 ;*****
00810 NUM EQU 80H ;CONSTANT FOR UNNEW
00820 ;*****
00830 ;***** START ADDRESS OF THIS ROUTINE *****
00840 START EQU 0FBC9H
00850 ;*****
00860 ;***** START OF FIND ROUTINE *****
00870 ;*****
00880 PSECT START
00890 ;** INITIALIZATION ROUTINE TO TAKE CONTROL FROM BASIC **
00900 INIZ LD HL,ENTRY ;MUST CHANGE BASIC...
00910 LD (JUMP1),HL ;'READY' JUMP ADDRESS...
00920 LD (JUMP2),HL ;TO GAIN CONTROL.
00930 JP READY ;GOTO BASIC 'READY'.
00940 ENTRY LD A,(MFLAG) ;TEST MOVE FLAG
00950 CP 0FFH ;IF SET, GO FINISH...
00960 JP Z,MOV3 ;MOVING LINE.
00970 LD A,(XREFLG) ;TEST 'XREF' FLAG
00980 CP 0FFH ;IF SET, CONTINUE...
00990 JP Z,REFIND ;SEARCHING PROGRAM.
01000 ;*****
01010 ;** TEST FOR AUTO LINE INCREMENT IN COMMUNICATIONS **
01020 ;** REGION. IF AUTO LINE INCREMENT IS ANYTHING OTHER **
01030 ;** THAN ZERO, RETURN CONTROL TO BASIC IMMEDIATELY. **
01040 ;*****
01050 LD A,(AUTOFLG) ;GET AUTO INC FLAG
01060 OR A ;TEST FOR ZERO
01070 JR NZ,ENTRY1 ;NO PROMPT IF AUTO ON
01080 LD HL,PROMPT ;PRINT A '$' PROMPT TO...
01090 CALL VDLIN ;REMIND USER THAT HE IS...
01100 ;UNDER CONTROL OF 'FIND'.
01110 ENTRY1 CALL KBLINE ;GO FETCH RUNSTRING.
01120 RET C ;<BREAK> KEY HIT
01130 LD A,B ;GET RUNSTRING LENGTH...
01140 LD (TLENT),A ;SAVE RUNSTRING LENGTH...
01150 ;IN CASE OF NEW STRING.
01160 EX AF,AF' ;MUST SAVE FLAGS AND...
01170 EXX ;REGISTERS FOR BASIC.
01180 LD DE,(BASBUF) ;FETCH COMMAND CHAR'S.
01190 RES 5,E ;FORCE TO UPPERCASE
01200 LD HL,CMDTBL ;POINT HL TO COMMAND TBL
01210 LD BC,18H ;# COMMANDS x 2 (254 MAX)
01220 ;***** COMMAND INTERPRETER *****
01230 CMDINT LD A,E ;GET 1st CHAR OF COMMAND
01240 CPI ;TEST AGAINST TABLE
01250 JR NZ,CMDIN1 ;IF NOT MATCH, TEST...
01260 LD A,D ;NEXT COMMAND, ELSE...
01270 CPI ;TEST FOR DELIMITER.
01280 JR Z,XEQCMD ;IF DELIMITER, EXECUTE
01290 JP PO,BASIC3 ;RET TO BASIC IF BC=0,...

```

Listing 1 continued



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Listing 1 continued

```

01300      INC      HL      ;ELSE POINT HL TO NEXT...
01310      INC      HL      ;COMMAND AND CONTINUE...
01320      JR       CMDINT  ;CMDTBL SEARCH.
01330 CMDIN1 INC      HL      ;INC HL TO POINT TO...
01340      INC      HL      ;NEXT COMMAND.
01350      INC      HL
01360      DEC      C        ;DECREMENT LOOP COUNTER
01370      JP       Z,BASIC3 ;NO 'FIND' COMMAND...
01380      JR       CMDINT  ;SO RETURN TO BASIC.
01390      JR       CMDINT  ;GO TEST NEXT ENTRY.
01400      ;*****
01410      ;* VALID 'FIND' COMMAND - SET UP JUMP ADDRESS & EXECUTE *
01420      ;*****
01430 XEQCMD LD      A,(HL)    ;MUST GET JP ADDRESS...
01440      INC      HL        ;INTO HL FOR JP.
01450      LD      H,(HL)
01460      LD      L,A
01470      JP       (HL)     ;HL POINTS AT CORRECT...
01480      ;*****
01490      ;***** ENTRY POINT TO 'XREF' ROUTINE *****
01500 XREF LD      A,0FFH     ;SET 'XREF' FLAG...
01510      LD      (XREFLG),A ;& DROP THROUGH TO 'FIND'
01520      ;***** ENTRY POINT TO SEARCH ('FIND') ROUTINE *****
01530 FIND LD      A,(TLENTH) ;TEST TO MAKE SURE...
01540      SUB      03H       ;WE HAVE A VALID...
01550      JP       Z,BASIC3 ;COMMAND BY RUNSTRING...
01560      ;LENGTH.
01570      POP      BC        ;POP 'BASIC' RETURN ADDR
01580      LD      HL,COUNT   ;MUST ALSO ZERO OUT...
01590      LD      (HL),00H   ;MATCH COUNTER.
01600      CALL    PRGTST    ;SEE IF PROGRAM RESIDENT
01610      JR       NZ,FIND1 ;PROGRAM IS RESIDENT
01620      CALL    NOPROG    ;NO PROGRAM EXISTS...
01630      JP       BASIC2   ;INFORM USER & QUIT.
01640 FIND1 LD      BC,001FH ;MAX SEARCH STRING LENGTH
01650      LD      DE,FTMP    ;'FIND' BUFFER ADDRESS
01660      LD      HL,BASBUF+2 ;START OF SEARCH STRING
01670      LDIR             ;COPY IT FOR 'FIND'
01680      LD      A,(TLENTH) ;RECOVER LINE LENGTH..
01690      SUB      03H       ;REMOVE EFFECT OF...
01700      CP       20H       ;COMMAND, DELIMITER,...
01710      JP       M,FIND2  ;AND TERMINATOR (CR).
01720      LD      A,1FH     ;THEN FORCE SEARCH...
01730      ;STRING LENGTH TO...
01740      ;31 CHARACTERS MAX.
01750 FIND2 LD      C,A       ;PUT SEARCH STRING...
01760      LD      B,00H      ;LENGTH INTO BC FOR...
01770      LD      (PLENTH),BC ;LOOP COUNTER AND STORE.
01780      LD      HL,(BASTRT) ;GET START ADDR OF PRGM
01790      ;*****
01800      ;***** BEGIN BASIC PROGRAM SEARCH *****
01810      ;*****
01820 FIND3 LD      (THSLIN),HL ;SAVE ADDR OF CURRENT LIN
01830      LD      C,(HL)     ;SET UP NEXT LINE ADDR.
01840      INC      HL
01850      PUSH    HL
01860      LD      B,(HL)
01870      LD      (NXTLIN),BC ;STORE NEXT LINE ADDRESS
01880      LD      HL,(NXTLIN) ;GET NEXT LINE ADDRESS
01890      INC      HL        ;NOW FETCH NEXT...
01900      INC      HL
01910      LD      E,(HL)     ;LINE # IN BINARY AND...
01920      INC      HL        ;STORE IT IN LINTMP.
01930      LD      D,(HL)
01940      LD      (LINTMP),DE ;SAVE CURRENT LINE #
01950      POP      HL        ;RESTORE CURRENT LINE ADR
01960      INC      HL
01970      INC      HL
01980      INC      HL
01990      CALL    EXPAND    ;POINT TO TEXT IN LINE
02000      LD      HL,BASBUF ;GO EXPAND BASIC LINE
02010 FIND4 LD      A,(FTMP)  ;ADDR OF EXPANDED LINE
02020      LD      BC,(PLENTH) ;FETCH 1ST CHAR OF STRING
02030      CPI             ;FETCH LENGTH OF STRING
02040      JR       Z,FIND7   ;COMPARE A TO (HL)
02050      DEC      HL        ;IF CHAR MATCH, TEST REST
02060      LD      A,00H       ;SEE IF BYTE WAS 00H...
02070      CP       (HL)
02080      INC      HL
02090      JR       NZ,FIND4  ;ie, END OF LINE MARKER
02100      ;POINT HL TO CURRENT CHAR
02110 FIND5 LD      HL,(NXTLIN) ;IF NOT 00H, TEST NEXT
02120      LD      A,00H       ;IF 00H, END OF LINE
02130      CP       (HL)     ;GET ADDRESS OF NEXT LINE
02140      ;TEST FOR END OF TEXT...
02150      ;ie, TWO BYTES OF 00H...
02160      ;WHERE AN ADDRESS...
02170      ;SHOULD BE.
02180      JR       NZ,FIND6   ;NOT END OF PROGRAM
02190      INC      HL        ;FIRST BYTE WAS 00H, SO..
02200      CP       (HL)     ;TEST NEXT. IF 00H,...
02210      JR       Z,FIND10  ;END OF BASIC TEXT.
02220 FIND6 LD      A,(FLAG)  ;IF FLAG SET, A MATCH...
02230      CP       00H       ;HAS BEEN FOUND, SO...
02240      JP       NZ,BASIC1 ;GO BACK TO INPUT PHASE.
02250      JR       REFIN1   ;IF FLAG NOT SET...
                                ;CONTINUE SEARCHING...
                                ;CONSECUTIVE LINES...

```

Listing 1 continued

Listing 1 continued

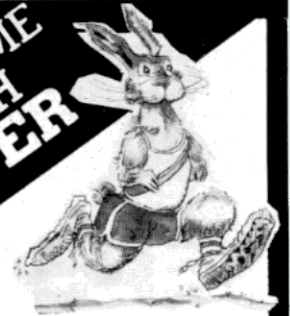
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02260 ;UNTIL A MATCH OR...
02270 ;END OF BASIC PROGRAM...
02280 ;IS FOUND.
02290 ;**** ENTRY POINT FOR REFIN COMMAND (ie, F<ENTER>) ****
02300 REFIN POP BC ;POP BASIC RETURN ADDRESS
02310 CALL PRGST ;SEE IF PROGRAM RESIDENT
02320 JR NZ,REFIN1 ;PROGRAM EXISTS...
02330 ;SO CONTINUE SEARCH.
02340 CALL NOPROG ;NO PROGRAM EXISTS...
02350 JP BASIC2 ;INFORM USER AND QUIT.
02360 REFIN1 LD DE,(LINTMP) ;GET ADDR OF NEXT LINE.
02370 CALL PSTSRC ;SEARCH PST FOR LINE ADDR
02380 JP C,REFIN2 ;NO SUCH LINE IF 'NC' SET
02390 LD HL,MESS6 ;Can't Continue message
02400 CALL VDLIN ;PRINT IT...
02410 LD HL,CRLF
02420 CALL VDLIN
02430 JP BASIC1 ;& RETURN TO BASIC.
02440 REFIN2 LD (THSLIN),HL ;SAVE CURRENT LINE ADDR
02450 LD (NXTLIN),BC ;SAVE NEXT LINE ADDR
02460 LD HL,(NXTLIN) ;PUT NEXT LINE ADDR IN HL
02470 JR FIND3 ;GO CONTINUE SEARCH
02480 ;*****
02490 ;*** FIRST CHARACTER MATCHED, NOW TEST REST OF STRING ***
02500 ;*****
02510 FIND7 PUSH HL ;SAVE CURRENT CHAR POINTR
02520 LD DE,FTEMP+01H ;DE POINTS @ SRCH STRING
02530 FIND8 LD A,B ;SEE IF BC = 0 YET
02540 OR C ;IF ZERO, WE HAVE A...
02550 JR Z,FOUND ;COMPLETE MATCH!!!
02560 LD A,(DE) ;MATCH NOT COMPLETE,...
02570 CPI ;SO TEST NEXT CHAR.
02580 JR NZ,FIND9 ;CHARACTER DIDN'T MATCH..
02590 ;SO GO CONTINUE WHERE...
02600 ;WE LEFT OFF.
02610 INC DE ;MATCH AGAIN, SO POINT...
02620 JR FIND8 ;AT NEXT CHAR & REPEAT.
02630 FIND9 POP HL ;RETRIEVE POSITION OF...
02640 JR FIND4 ;SEARCH AND GO CONTINUE..
02650 ;WHERE WE LEFT OFF.
02660 FIND10 LD HL,MESS1 ;END OF TEXT FOUND...
02670 CALL VDLIN ;SO PRINT MESSAGE.
02680 LD HL,(COUNT) ;GET TOTAL # MATCHES...
02690 CALL BINASC ;CONVERT & PRINT IT.
02700 LD HL,MESS2
02710 CALL VDLIN ;PRINT REST OF MESSAGE.
02720 LD HL,(BASTRT)
02730 LD (NXTLIN),HL ;POINT TO START OF PROGRAM
02740 INC HL ;MUST ALSO POINT LINTMP...
02750 INC HL ;TO FIRST LINE #...
02760 LD E,(HL) ;IN BASIC PROGRAM.
02770 INC HL
02780 LD D,(HL)
02790 LD (LINTMP),DE
02800 LD A,0FFH
02810 LD (FLAG),A ;SET END OF TEXT FLAG.
02820 LD A,00H
02830 LD (XREFLG),A ;RESET 'XREF' FLAG
02840 LD HL,COUNT ;MUST ALSO ZERO OUT...
02850 LD (HL),00H ;MATCH COUNTER.
02860 JP BASIC1 ;GO BACK TO INPUT
02870 ;*****
02880 ;**** COMPLETE MATCH FOUND - PRINT LINE & RETURN TO USER.
02890 ;*****
02900 FOUND POP HL ;CLEAN UP STACK
02910 LD HL,(THSLIN) ;LINE WHERE MATCH FOUND
02920 INC HL ;NOW INC HL TO POINT...
02930 INC HL ;TO LINE #.
02940 LD C,(HL) ;MOVE IT INTO BC...
02950 INC HL
02960 LD B,(HL) ;NOW SAVE IT IN...
02970 LD (LINTMP),BC ;CURRENT LINE POINTER
02980 PUSH BC ;PUT LINE # IN HEX...
02990 POP HL ;INTO HL TO CONVERT...
03000 CALL BINASC ;AND PRINT LINE #.
03010 LD HL,BLANK ;PRINT A BLANK...
03020 CALL VDLIN ;AFTER LINE NUMBER.
03030 LD A,(XREFLG) ;TEST 'XREF' FLAG
03040 CP 00H ;SEE IF IT IS SET
03050 JR NZ,FIND11 ;IF SET, PRINT ONLY LINE#
03060 LD HL,BASBUF ;PUT ADDRESS OF...
03070 CALL VDLIN ;EXPANDED LINE INTO HL...
03080 ;AND PRINT LINE.
03090 LD HL,CRLF ;CARRIAGE RETURN TO...
03100 CALL VDLIN ;TERMINATE LINE WITH.
03110 FIND11 LD HL,COUNT ;GET # MATCHES...
03120 INC (HL) ;AND INCREMENT IT.
03130 LD A,0FFH
03140 LD (FLAG),A ;SET MATCH FLAG
03150 JP FIND5 ;BACK TO INPUT ROUTINE
03160 ;***** ENTRY POINT FOR N<ENTER> COMMAND *****
03170 MCHCNT LD HL,(COUNT) ;PRINT # MATCHES FOR USER
03180 CALL BINASC ;GO PRINT COUNT
03190 LD HL,MESS2 ;PRINT REST OF MESSAGE
03200 CALL VDLIN
03210 POP BC ;POP RET ADDR OFF STACK
03220 JP BASIC2 ;RETURN TO BASIC 'READY'

```

Listing 1 continued

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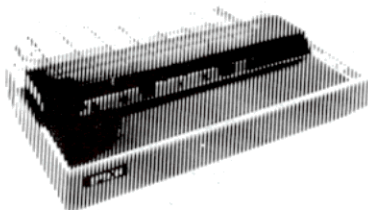
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03230 ;***** ENTRY POINT FOR E<ENTER> COMMAND *****
03240 EDIT1 POP BC ;POP BASIC RETURN ADDRESS
03250 LD DE,(LINPTR) ;LINE # TO EDIT.
03260 JP EDIT ;LET USER EDIT LINE
03270 ;***** ENTRY POINT FOR R<ENTER> COMMAND *****
03280 REPLAC LD A,0FFH ;SET FLAG FOR COPY.
03290 LD (RFLAG),A ;SO IT CAN REPLACE...
03300 ;AN EXISTING LINE.
03310 ;***** ENTRY POINT FOR C<ENTER> COMMAND *****
03320 COPY LD HL,BASBUF+2 ;GET ASCII SOURCE LINE #
03330 CALL ASCBIN ;CONVERT SOURCE TO BINARY
03340 LD (OLDLIN),DE ;STORE IT
03350 INC HL ;POINT TO ASCII...
03360 ;DESTINATION LINE NUMBER.
03370 CALL ASCBIN ;CONVERT IT TO BINARY
03380 LD (NEWLIN),DE ;STORE IT
03390 CALL PSTSRC ;GO SEARCH PST FOR...
03400 ;DESTINATION LINE #...
03410 JP NC,COPY1 ;IF IT DOESN'T EXIST...
03420 ;WE CAN COPY TO IT.
03430 LD A,(RFLAG) ;CHECK <R> REPLACE FLAG...
03440 CP 0FFH ;IF IT IS SET...
03450 ;WE WILL COPY OVER IT.
03460 JR Z,COPY1 ;FLAG WAS SET - REPLACE
03470 LD A,(MFLAG) ;ALSO TEST MFLAG - WE...
03480 CP 0FFH ;WILL UNCONDITIONALLY...
03490 JR Z,COPY1 ;MOVE A LINE.
03500 LD HL,MESS3 ;INFORM USER THAT LINE...
03510 CALL VDLIN ;ALREADY EXISTS.
03520 POP BC ;POP BASIC RETURN ADDRESS
03530 JP BASIC2 ;AND RETURN TO BASIC.
03540 LD A,00H ;MUST ZERO OUT...
03550 LD (RFLAG),A ;REPLACE FLAG.
03560 LD DE,(OLDLIN) ;GET # OF LINE TO COPY...
03570 CALL PSTSRC ;SEE IF IT EXISTS...
03580 JR C,COPY2 ;IF IT DOES, WE CAN...
03590 LD HL,NOLINE ;COPY, ELSE INFORM USER..
03600 CALL VDLIN ;THAT LINE DOESN'T EXIST.
03610 LD HL,CRLF ;MUST PRINT CARRIAGE...
03620 CALL VDLIN ;RETURN & LINE FEED.
03630 POP BC ;POP BASIC RETURN ADDRESS
03640 LD A,00H ;MUST RESET MFLAG...
03650 LD (MFLAG),A ;IN CASE OF MOVE CMD.
03660 JP BASIC2 ;RETURN TO BASIC
03670 COPY2 PUSH BC ;SAVE OLD LINE ADDRESS
03680 LD HL,(NEWLIN) ;GET BINARY LINE #...
03690 CALL BINASC ;GO CONVERT AND PRINT IT
03700 LD HL,BLANK ;PRINT BLANK AFTER...
03710 CALL VDLIN ;LINE #.
03720 ;** NOW WE MUST MOVE ASCII LINE # TO BASBUF FOR BASIC **
03730 LD DE,BASBUF ;ADDRESS TO MOVE TO
03740 LD HL,BINBUF ;ADDRESS TO MOVE FROM
03750 LD BC,05H ;MAX # BYTES TO MOVE
03760 COPY3 LD A,(HL) ;HAVE PRECEDING BLANKS...
03770 CP ' ' ;MUST STRIP THEM TO...
03780 JR NZ,COPY4 ;AVOID PUTTING THEM...
03790 DEC BC ;INTO BASBUF.
03800 INC HL
03810 JR COPY3
03820 COPY4 LD A,C ;SAVE # ASCII BYTES IN A.
03830 LDIR ;MOVE ASCII LINE # TO HL.
03840 POP HL ;LINE ADDRESS TO HL...
03850 INC HL ;INC HL 4 TIMES...
03860 INC HL ;TO POINT AT START...
03870 INC HL ;OF ASCII TEXT OF LINE.
03880 INC HL
03890 LD BC,BASBUF ;GET BUFFER ADDRESS
03900 ADD A,C ;AND BUMP UP SO WE...
03910 LD C,A ;DON'T OVERWRITE LINE #.
03920 PUSH BC ;SAVE ADDRESS FOR HL.
03930 CALL EXPAN1 ;GO EXPAND LINE AND...
03940 POP HL
03950 CALL VDLIN ;PRINT REST OF LINE.
03960 LD HL,CRLF ;PRINT CARRIAGE RETURN
03970 CALL VDLIN
03980 JP BASIC3 ;RETURN AND LET BASIC...
03990 ;COMPRESS & INSERT LINE.
04000 ;***** ENTRY POINT FOR M<ENTER> COMMAND *****
04010 MOVE LD HL,BASBUF+2 ;PREPARE TO MOVE...
04020 LD DE,MOVBUF ;ASCII LINE # TO...
04030 LD BC,05H ;MOVBUF TO STORE.
04040 MOV1 LDI ;SAVE ASCII CHARACTER
04050 LD A,(HL) ;GET NEXT CHAR.
04060 CP ' ' ;TEST FOR ' '
04070 JR Z,MOV2 ;IF ' ', GO COPY
04080 LD A,B ;IF BC=0 AND NO ' '...
04090 OR C ;DELIMITER, MORE THAN...
04100 JP Z,BASIC3 ;5 CHAR'S - SYNTAX ERROR
04110 JR MOV1 ;TEST NEXT CHARACTER
04120 MOV2 LD A,0FFH ;SET 'MOVE' FLAG...
04130 LD (MFLAG),A ;TO ALL 1'S
04140 JP COPY ;GO COPY LINE.
04150 ;***** REENTRY POINT FOR M<ENTER> COMMAND *****
04160 MOV3 LD HL,MOVBUF ;ENTER ASCII SOURCE...
04170 LD DE,BASBUF ;LINE # INTO BASBUF TO...
04180 LD BC,06H ;DELETE SOURCE LINE.
04190 LDIR

```

Listing 1 continued on p. 66

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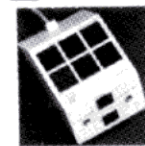
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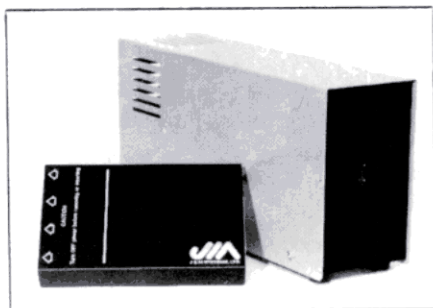
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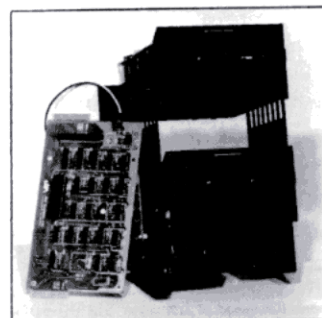
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Listing 1 continued from p. 62

```

04200 LD A,00H
04210 LD (MFLAG),A ;RESET MFLAG
04220 LD (MOVBUF),A ;ZERO OUT MOVBUF
04230 LD HL,MOVBUF ;SIX BYTES TO ZERO OUT
04240 DE,MOVBUF+1
04250 LD BC,05H
04260 LDIR
04270 LD HL,BASBUF-1 ;SET UP HL FOR BASIC
04280 OR A ;CLEAR CARRY FLAG
04290 RET ;RETURN TO BASIC 'READY'
04300 ;***** ENTRY POINT FOR U<ENTER> COMMAND *****
04310 UNNEW LD HL,(BASTRT) ;GET START OF BASIC PROG
04320 LD A,(HL) ;SEE IF PROGRAM HAS...
04330 INC HL ;ACTUALLY BEEN 'NEW'ED...
04340 LD B,(HL) ;BEFORE ATTEMPTING TO...
04350 OR B ;RESTORE IT BY TESTING...
04360 JR NZ,UNNEW5 ;FIRST PST LINE POINTER..
04370 DEC HL ;IF 0, HAS BEEN 'NEW'ED.
04380 LD DE,0FH ;POINT TO 1ST UNCHANGED..
04390 ADD HL,DE ;BYTE IN MEMORY.
04400 LD BC,249 ;MAXIMUM LINE LENGTH
04410 UNNEW1 LD A,00H ;END OF LINE MARKER
04420 CPJR ;SEARCH FOR END OF LINE
04430 JR NZ,UNNEW5 ;IF NZ, NO MATCH - EXIT.
04440 INC HL ;A 'GOTO' OR 'GOSUB'...
04450 LD A,NUM ;COULD PUT A ZERO INTO...
04460 CP (HL) ;A LINE, SO TEST MSB...
04470 JR Z,UNNEW2 ;OF 2nd BYTE AFTER ZERO..
04480 INC A ;FOUND. IF 00H OR 81H...
04490 CP (HL) ;IS THERE, WE HAVE A...
04500 JR Z,UNNEW2 ;GOOD CHANCE THAT WE...
04510 DEC HL ;HAVE INDEED FOUND THE...
04520 JR UNNEW1 ;END OF THE LINE - IF...
04530 ;NOT WE DEFINITELY HAVE..
04540 ;NOT FOUND IT.
04550 UNNEW2 DEC HL ;POINT HL TO START OF...
04560 ;FIRST VALID LINE FOUND.
04570 EX DE,HL ;MOVE POINTER INTO DE
04580 LD HL,(BASTRT) ;GET START OF BASIC PROG
04590 LD BC,0BH ;WE MUST RE-ESTABLISH...
04600 ADD HL,BC ;PROGRAM LINKAGE BY...
04610 LD (HL),E ;PUTTING A NEXT LINE...
04620 INC HL ;POINTER INTO MEMORY...
04630 LD (HL),D ;AT START OF REMAINDER...
04640 INC HL ;OF LINE FOUND, AND A...
04650 LD (HL),01H ;LINE # (1) ALSO.
04660 INC HL
04670 LD (HL),00H
04680 LD HL,(BASTRT) ;GET START OF BASIC PROG
04690 PUSH HL ;SAVE IT
04700 LD DE,0BH ;# BYTES TO START...
04710 ADD HL,DE ;OF 2ND LINE.
04720 EX DE,HL ;MOVE RESULT INTO 'DE'
04730 POP HL ;GET START OF PROGRAM
04740 LD (HL),E ;SET UP NEXT LINE POINTER
04750 INC HL
04760 LD (HL),D
04770 INC HL
04780 LD (HL),00H ;SET UP LINE # AS 0
04790 INC HL
04800 LD (HL),00H
04810 INC HL
04820 LD BC,05H
04830 PUSH HL ;GET HL INTO DE
04840 POP DE
04850 INC DE ;POINT TO NEXT CHARACTER
04860 LD (HL),'U' ;PAD LINE WITH...
04870 LDIR ;ASCII 'U's.
04880 LD (HL),00H ;END OF LINE MARKER
04890 ;*****
04900 ;** WE HAVE NOW RE-ESTABLISHED THE PROGRAM LINKAGE FOR **
04910 ;** BASIC. THERE IS ONE THING LEFT TO DO; LOCATIONS **
04920 ;** 719FH & 71A0H CONTAIN THE ADDRESS THAT IS THE END **
04930 ;** OF THE BASIC PROGRAM + 3 BYTES, AND THE 'NEW' **
04940 ;** COMMAND RESETS THAT POINTER, SO NOW WE SEARCH FOR **
04950 ;** THE END OF THE PROGRAM, MARKED WITH TWO BYTES OF **
04960 ;** 00H, INC HL BY 3 TO POINT AT THIS LOCATION, THEN **
04970 ;** RE-ESTABLISH THE END OF PROGRAM MARKER IN THE **
04980 ;** COMMUNICATIONS REGION AT 719FH & 71A0H. **
04990 ;** NOTE: THE ABOVE LOCATIONS ARE 611BH & 611CH **
05000 ;** IN BASIC 01.00.00. SEE BASEND AT START OF PROGRAM. **
05010 ;*****
05020 LD A,00H ;END OF PROG MARKER
05030 LD HL,(BASTRT) ;GET START OF PROG ADDR
05040 UNNEW3 LD E,(HL) ;GET ADDRESS OF NEXT...
05050 INC HL ;LINE POINTER INTO DE.
05060 LD D,(HL)
05070 EX DE,HL ;MOVE IT INTO HL SO...
05080 CP (HL) ;WE CAN TEST FOR ZERO.
05090 JR NZ,UNNEW3 ;IF NOT ZERO, GO TEST...
05100 INC HL ;NEXT LINE POINTER...
05110 CP (HL) ;ELSE TEST NEXT BYTE.
05120 JR Z,UNNEW4 ;IF IT IS ALSO ZERO,...
05130 ;HAVE END OF PROGRAM,...
05140 DEC HL ;ELSE DEC HL TO POINT...
05150 JR UNNEW3 ;AT NEXT LINE POINTER...

```

Listing 1 continued



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05680      INC UNNEW4 INC
05690      INC UNNEW4 INC
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05800      INC UNNEW4 INC
05810      INC UNNEW4 INC
05820      INC UNNEW4 INC
05830      INC UNNEW4 INC
05840      INC UNNEW4 INC

;AGAIN AND GO TEST...
;NEXT LINE.
;INC HL TWICE TO RE-...
;ESTABLISH COMM REGION.
;PUT INTO COMM REGION.
;ASCII '0' TO TRICK...
;INTERPRETER INTO...
;DELETING FIRST LINE.
;LINE TERMINATOR
;RETURN TO BASIC
;BASIC PROGRAM IS NOT...
;RESTORABLE, SO INFORM...
;USER AND QUIT. *****
;ENTRY POINT FOR S<ENTER> COMMAND *****
;POINT TO FIND STRING
;PRINT IT FOR USER
;PRINT CRLF
;POP RET ADDR OFF STACK
;GOTO BASIC 'READY'
;ENTRY POINT FOR L<ENTER> COMMAND *****
;PRINT CURRENT LINE...
;NUMBER FOR USER.
;PRINT CRLF ALSO
;POP RET ADDR OFF STACK
;BASIC2
;EXIT POINTS TO RETURN TO BASIC INTERPRETER *****
;RESET END OF TEXT FLAG.
;RESTORE ALL REGISTERS...
;AND FLAGS FOR BASIC.
;RETURN TO BASIC
;RESTORE REGISTERS AND...
;FLAGS AND RETURN...
;TO BASIC.
;ENTRY POINT FOR Q<ENTER> COMMAND *****
;RESTORE BASIC JUMP...
;ADDRESSES.
;RETURN TO BASIC
;RETURN TO BASIC
;SAVE CALLER'S REGISTERS
;GET END OF PROGRAM ADDR
;GET START OF PROG ADDR
;DEC HL TWICE - IF IT...
;MATCHES DE, NO PROGRAM.
;CLEAR CARRY
;SUBTRACT END FROM START
;EXIT WITH ZERO FLAG....
;SET IF NO PROGRAM EXISTS
;RETURN TO CALLER
;RETURN TO CALLER
;GET NO PROGRAM EXISTS *****
;PRINT MESSAGE
;RESET 'XREF' FLAG
;RETURN TO CALLER
;START OF COMMAND TABLE *****
;FIND COMMAND
;DELIMITER
;JP ADDRESS
;REFIND COMMAND
;XREF COMMAND
;XREF

```

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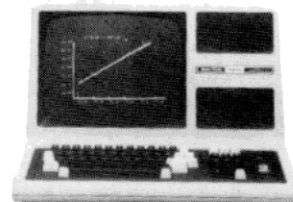
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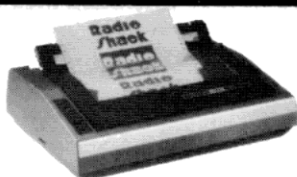
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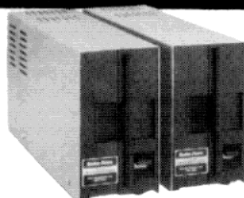
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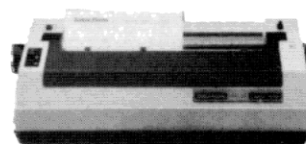
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Edittext combines the simplicity of a full-screen editor with the efficiency of a line editor in only 2K of memory.

Hybrid Vigor

by Theodore Diamant

I

f, for one reason or another, you're dissatisfied with your present Model III text editor, you might find Edittext the perfect alternative—it's written in machine language, takes only a few minutes to learn, and uses only 2K of memory.

Defining an Editor

An editor lets you enter and correct data before processing it. Essentially, two types of editors are available: a full-screen editor and a line editor. A full-screen editor, like that in Scripsit, lets you move the cursor anywhere on the screen to insert text or correct mistakes. Such an editor makes no distinction between lines, as it treats the entire document as one unit.

In contrast, a line editor, such as the editor in Basic, treats each line as a separate entity, delineated by a line number. To correct a mistake, you specify the appropriate line and make corrections within that line only.

Learning to use a line editor is generally easier than learning a screen editor, but it's much slower. This is especially true when you have to make a lot of corrections. However, the line editor is more efficient when you edit a program because you're making corrections to a specific portion of the program only, rather than to the file as a whole. As a result, the editor saves just the corrections back to disk, instead of the entire file.

Edittext

Edittext offers the best of both worlds by combining the power of a full-screen editor with the simplicity of a line editor. With Edittext, you can

move the cursor anywhere on the screen, but affect only one line.

Because Edittext saves all text in ASCII format, you can use it in conjunction with Basic and Scripsit, as well as with many other programs. Edittext is excellent for editing programs, storing recipes and phone numbers, displaying messages, or examining disk files.

In addition, you could easily apply Edittext to a communications program. You can use it to edit a file before sending it over your modem.

Using Edittext

Edittext is as easy to use as it sounds. You boot up Edittext directly from DOS Ready and you're ready to process text. Type your text directly onto the screen or execute any one of the seven commands by hitting control (the shift and down-arrow keys) together with the first letter of the command (see the Table). In addition, the four arrow keys let you position the nondestructive cursor anywhere on the screen.

The program itself is short and easily understood. The main routine, KBOARD, blinks the cursor until it receives a character from the keyboard. If the character represents a command, it jumps to the appropriate command, rather than display the character on-screen.

The routines for each command can stand alone. They will all return to the routine that calls them. For example, the routine SASC saves the text to an ASCII disk file using a rarely publicized ROM routine.

Regardless of the application, you'll find Edittext to be a helpful and handy editor. ■

You can reach Theodore Diamant at 148 Wellington Ave., New Rochelle, NY 10804.

Command	Definition
Open	Opens a space for inserting a character
Delete	Deletes a character on a line
Line	Creates a new blank line
Kill	Deletes an entire line
Print	Sends text to line printer
File	Saves or loads text on disk
Quit	Exits Edittext

Table. Edittext commands.

The Key Box



**Model III
32K RAM
Editor/Assembler
Disk Drive**

Program Listing. Edittext, a machine-language text editor.

```
00100 ;-----
00110 ;--- Text Editor Written By Theodore Diamant ---
00120 ;---
00130 ;--- Version 1.1 With Disk Save Routine ---
00140 ;-----
```

Listing continued

Listing continued

```

00150 ;
00160 ;
00170 BEGIN EQU 5200H ;END OF TRSDOS
00180 TXTBEG EQU BEGIN ;BEGINNING OF TEXT
00190 TXTPOS EQU BEGIN+2 ;POSITION ON LINE OF TEXT
00200 TXTEND EQU BEGIN+4 ;END OF TEXT
00210 BEGLIN EQU BEGIN+6 ;START OF LINE OF TEXT
00220 SCNLIN EQU BEGIN+8 ;SCREEN POSITION OF LINE
00230 SCREEN EQU BEGIN+10 ;TEXT ON TOP SCREEN LINE
00240 CCHAR EQU BEGIN+12 ;CURSOR CHARACTER
00250 CHAR EQU BEGIN+14 ;KEYBOARD INPUT CHARACTER
00260 TIME EQU BEGIN+16 ;TIME OF CURSOR BLINK
00270 STORE1 EQU BEGIN+18 ;DUMMY STORAGE LOCATION
00280 STORE2 EQU BEGIN+20 ;DUMMY STORAGE LOCATION
00290 STACK EQU BEGIN+90 ;STACK POSITION
00300 BUFPPOS EQU BEGIN+92 ;DISK BUFFER POSITION
00310 BUFFER EQU BEGIN+100 ;256 BYTE DISK BUFFER
00320 DCB EQU BEGIN+356 ;50 BYTE DATA CNTRL BLOCK
00330 ORG BEGIN+406 ;EXECUTION LOCATION
00340 JP START ;SKIP OVER MESSAGES
00350 HELP DEFM 'Open Delete Line Kill Print '
00360 DEFM 'File Quit'
00370 DEFB 3
00380 DISK DEFM 'Save to disk or Load from disk?'
00390 DEFB 3
00400 SPEC DEFM 'Enter File Specification --: '
00410 DEFB 3
00420 TITLE DEFM 'JAX by Theodore Diamant (c) 1983.'
00430 DEFB 3
00440 START CALL INIT ;INITIALIZE VARIABLES
00450 LD HL,BEGIN+83FH ;GET TEXT END
00460 LD (TXTEND),HL ;STORE IT
00470 CALL CLS ;CLEAR THE SCREEN
00480 CALL CLEAR ;CLEAR LAST SCREEN LINE
00490 LD DE,TITLE ;POINT TO TITLE
00500 CALL MESSAGE ;DISPLAY TITLE
00510 CALL KBRD ;WAIT FOR A CHARACTER
00520 CALL HELPER ;DISPLAY COMMANDS
00550 KBOARD LD SP,STACK ;CLEAR STACK
00560 CALL KBRD ;WAIT FOR A CHAR
00570 LD HL,KBOARD ;GET RETURN POSITION
00580 PUSH HL ;PUT IT ON STACK
00590 CP 9 ;IF RIGHT ARROW
00600 JP 2,RAROW ; THEN MOVE RIGHT
00610 CP 8 ;IF LEFT ARROW
00620 JP 2,LAROW ; THEN MOVE LEFT
00630 CP 4 ;IF CONTROL 'D'
00640 JP 2,DELETE ; THEN DELETE A CHAR
00650 CP 15 ;IF CONTROL 'O'
00660 JP 2,OPEN ; THEN INSERT A SPACE
00670 CP 10 ;IF DOWN ARROW
00680 JP 2,DAROW ; THEN MOVE DOWN
00690 CP 0DH ;IF ENTER KEY
00700 JP 2,DAROW ; THEN CARRIAGE RETURN
00710 CP 91 ;IF UP ARROW
00720 JP 2,UAROW ; THEN MOVE UP
00730 CP 11 ;IF CONTROL 'K'
00740 JP 2,KILL ; THEN KILL A LINE
00750 CP 12 ;IF CONTROL 'L'
00760 JP 2,LINE ; THEN INSERT A LINE
00770 CP 27 ;IF CONTROL 'T'
00780 JP 2,TOP ; THEN GO TO TOP OF TEXT
00790 CP 16 ;IF CONTROL 'P'
00800 JP 2,PRINT ; THEN SEND TO PRINTER
00810 CP 6 ;IF CONTROL 'F'
00820 JP 2,FILE ; THEN FILE ON THE DISK
00830 CP 17 ;IF CONTROL 'Q'
00840 JP 2,402DH ; THEN RETURN TO TRSDOS
00850 CP 32 ;IS IT A BAD CHAR
00860 RET M ;RETURN IF IT IS
00870 LD HL,(BEGLIN) ;GET LINE OF TEXT
00880 CALL POS ;FIND CHAR POSITION
00890 LD A,(CHAR) ;GET INPUT CHARACTER
00900 LD (HL),A ;PUT CHAR IN RAM
00910 CALL RAROW ;MOVE CURSOR RIGHT
00920 JP COPY ;COPY RAM TO SCREEN
00930 RAROW LD A,(TXTPOS) ;GET CURSOR POSITION
00940 CP 63 ;IF AT RIGHT MARGIN
00950 RET Z ; THEN RETURN
00960 INC A ;ELSE BUMP CURSOR POS
00970 JR L1 ;STORE CURSOR POS
00980 LAROW LD A,(TXTPOS) ;GET CURSOR POSITION
00990 OR A ;IF AT LEFT MARGIN
01000 RET Z ; THEN RETURN
01010 DEC A ;ELSE MOVE POS LEFT
01020 L1 LD (TXTPOS),A ;STORE THE POSITION
01030 RET
01040 DELETE CALL COUNT ;GET NUMBER OF CHAR
01050 LD HL,(BEGLIN) ;GET START OF LINE
01060 CALL POS ;GET ADDRESS OF CURSOR
01070 PUSH HL ;TRANSFER IT TO DE
01080 POP DE ;DE=CURSOR ADDRESS
01090 INC HL ;HL=ONE ADDRESS TO RIGHT
01100 LDIR ;SCROLL THE TEXT
01110 JP BLANK ;PUT A BLANK IN LAST POS
01120 OPEN CALL COUNT ;GET NUMBER OF CHARS

```

Listing continued

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Listing continued

```

01130 LD HL,(BEGLIN) ;GET START OF LINE
01140 LD DE,63 ;LENGTH OF LINE
01150 ADD HL,DE ;HL=ADDRESS OF R-MARGIN
01160 PUSH HL ;TRANSFER IT TO DE
01170 POP DE ;DE=RIGHT MARGIN
01180 DEC HL ;HL=ONE TO THE LEFT
01190 LDDR ;SCROLL THEN LINE
01200 JP BLANK ;PUT BLANK IN LAST POS
01210 DAROW CALL DTXT ;INCREASE BEGLIN BY 64
01220 CALL DSCN ;INCREASE SCNLIN BY 64
01230 LD A,(CHAR) ;GET INPUT CHARACTER
01240 CP 0DH ;IF IT IS CARRIAGE RETURN
01250 RET NZ ; NO IT IS NOT. SO RETURN
01260 LD A,0 ; YES IT IS. SO
01270 LD (TXTPOS),A ; MOVE CURSOR TO L-MARGIN
01280 RET
01290 UAROW CALL UTXT ;DECREASE BEGLIN BY 64
01300 JP USCN ;DECREASE SCNLIN BY 64
01310 KILL CALL NUMBER ;GET NUMBER OF CHAR
01320 LD DE,(BEGLIN) ;GET CURRENT LINE OF RAM
01330 LD HL,64 ;ADD 64
01340 ADD HL,DE ;SOURCE=1 LINE DOWN
01350 LD DE,(BEGLIN) ;DESTINATION=CURRENT LINE
01360 LDIR ;SCROLL THE TEXT
01370 LD IX,TXTEND ;GET THE END OF TEXT
01380 CALL SUB ;DECREASE BY 64
01390 JP DITTO ;COPY TO SCREEN
01400 LINE CALL NUMBER ;GET NUMBER OF CHAR
01410 LD HL,64 ;MUST SCROLL ANOTHER LINE
01420 ADD HL,BC ;HL=NUMBER OF CHAR
01430 PUSH HL ;TRANSFER HL
01440 POP BC ;TO BC=NUMBER OF CHAR
01450 LD HL,(TXTEND) ;SOURCE=END OF TEXT
01460 PUSH HL ;STORE IT
01470 LD IX,TXTEND ;GET END OF TEXT
01480 CALL ADD ;EXTEND IT ONE LINE
01490 LD DE,(TXTEND) ;DESTINATION=NEW TEXT END
01500 POP HL ;RETRIEVE SOURCE
01510 LDDR ;CREATE A NEW LINE
01520 CALL CLEAR ;CLEAR THE NEW LINE
01530 JP DITTO ;COPY TO SCREEN
01540 PRINT LD HL,(BEGLIN) ;GET CURRENT LINE
01550 P0 LD C,57 ;GET PAGE LENGTH
01560 P1 LD B,8 ;L-MARGIN=8,R-MARGIN=72
01570 P3 LD A,' ' ;SEND CODE FOR SPACE
01580 CALL 3BH ;ROM LINE PRINT
01590 DJNZ P3 ;LOOP TILL DONE
01600 LD B,64 ;COUNT FOR ONE LINE
01610 P2 LD A,(HL) ;GET THE CHARACTER
01620 CALL 3BH ;SEND TO PRINTER
01630 INC HL ;BUMP CURRENT CHARACTER
01640 DJNZ P2 ;LOOP TILL DONE
01650 LD A,0DH ;CARRIAGE RETURN
01660 CALL 3BH ;SEND C/R TO PRINTER
01670 LD (STORE1),HL ;STORE CURRENT TEXT POS
01680 LD DE,(TXTEND) ;GET TEXT END
01690 CALL SBC ;IF WE ARE AT THE END
01700 RET P ; THEN RETURN
01710 LD HL,(STORE1) ; ELSE GET POSITION
01720 DEC C ;IF NOT AT END OF PAGE
01730 JR NZ,P1 ;THEN LOOP
01740 LD B,8 ;COUNT=8
01750 LD A,0DH ;GET CARRIAGE RETURN CHAR
01760 P4 CALL 3BH ;SEND TO PRINTER
01770 DJNZ P4 ;FORM FEED PRINTER
01780 JR P0 ;LOOP TILL DONE
01790 TOP CALL INIT ;GET INITIAL VALUES
01800 JP DITTO ;DISPLAY FIRST SCREEN
01810 NUMBER LD HL,(TXTEND) ;GET END OF TEXT
01820 LD DE,(BEGLIN) ;GET CURRENT LINE
01830 CALL SBC ;FIND THE DIFFERENCE
01840 LD DE,63 ;SUBTRACT 63
01850 CALL SBC ;IF WE ARE ON LAST LINE
01860 JP Z,KBOARD ; THEN RESTART
01870 PUSH HL ; ELSE TRANSFER HL
01880 POP BC ; TO BC=NUMBER OF CHAR
01890 RET
01900 DTXT LD IX,BEGLIN ;GET CURRENT LINE
01910 CALL ADD ;MOVE DOWN ONE LINE
01920 LD DE,(TXTEND) ;GET END OF TEXT
01930 CALL SBC ;IF WE DID NOT EXCEED END
01940 RET M ; THEN RETURN
01950 LD IX,TXTEND ; ELSE GET END OF TEXT
01960 CALL ADD ;EXTEND IT ONE LINE
01970 JP CLEAR ;CLEAR THE NEW LINE
01980 UTXT LD HL,(TXTBEG) ;GET START OF TEXT
01990 LD DE,(BEGLIN) ;GET CURRENT LINE
02000 CALL SBC ;IF WE ARE AT THE TOP
02010 JP Z,KBOARD ; THEN RESTART
02020 LD IX,BEGLIN ; ELSE GET CURRENT LINE
02030 JP SUB ; MOVE IT BACK ONE LINE
02040 DSCN LD HL,(SCNLIN) ;GET CURRENT SCREEN LINE
02050 LD DE,16192 ;GET LAST SCREEN LINE
02060 CALL SBC ;IF WE ARE ON LAST LINE
02070 JP Z,DSCN ; THEN MOVE DOWN SCROLL
02080 LD IX,SCNLIN ; ELSE GET SCREEN LINE

```

Listing continued

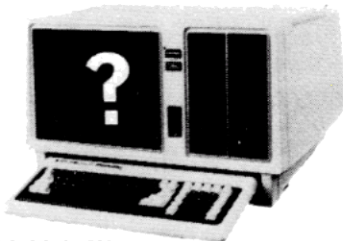
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The INSTANT ASSEMBLER is a powerful machine language development system for the TRS-80. One program contains the editor, assembler, and debugger. It allows you to assemble directly to memory and immediately debug your programs with the built-in single stepping debugger. Quickly switch from assembler to debugger and back again without losing the source code. This feature makes INSTANT ASSEMBLER an excellent learning tool for the beginner and a super fast development system for the experienced programmer. INSTANT ASSEMBLER has many other unique features. It detects syntax errors as source is entered and stores its source in a compressed format that uses only 40% as much memory as other assemblers. It is incredibly fast and will assemble 10K of object code in just 8 seconds. It will also create relocatable code modules that can be saved on disk or tape and linked together for very large or modular assemblies. INSTANT ASSEMBLER comes with a comprehensive 65 page instruction manual and is available in several versions for different machines. The CP/M version does not run on all machines so inquire before ordering.

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INSIDE LEVEL II

This book is a comprehensive reference guide to the Model 1 and Model 3 ROMs which allows the machine language programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. In addition, the 18 chapters include a large body of other information useful to the programmer. 80 Micro said "The book has no flaws; it is a perfect gem." Byte Magazine said "I recommend this book to serious machine language programmers."

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DEMON DEBUGGER

DEMON (for DEbugger and MONitor) is a sophisticated tool with which you can explore and debug machine language programs. The STEP mode has 19 different commands and will step through machine language programs one instruction at a time, showing you the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The MONITOR mode has 26 different commands including a labeling disassembler. DEMON is available on tape or disk and includes a comprehensive 40 page manual with many examples.

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Listing continued

```

02090 JP ADD ;EXTEND IT ONE LINE
02100 USCN LD HL,(SCNLIN) ;GET SCREEN LINE
02110 LD DE,3C00H ;GET TOP LINE
02120 CALL SBC ;IF WE ARE AT TOP LINE
02130 JP Z,USCEN ;THEN SCROLL THE SCREEN
02140 LD IX,SCNLIN ;ELSE GET SCREEN LINE
02150 JP SUB ;MOVE IT BACK UP ONE LINE
02160 DSCREN LD IX,SCREEN ;GET THE SCREEN POINTER
02170 CALL ADD ;MOVE IT DOWN ONE LINE
02180 JP DITTO ;COPY TO SCREEN
02190 USCEN LD IX,SCREEN ;GET SCREEN POINTER
02200 CALL SUB ;MOVE IT BACK UP ONE LINE
02210 JP DITTO ;COPY TO THE SCREEN
02220 ADD LD HL,0019H ;ADD HL,DE INSTRUCTION
02230 JR ARITH ;PERFORM ARITHMATIC
02240 SUB LD HL,052EDH ;SBC HL,DE INSTRUCTION
02250 ARITH LD (INST),HL ;PROGRAM THE INSTRUCTION
02260 LD DE,64 ;GET LENGTH OF A LINE
02270 LD H,(IX+1) ;GET MSB
02280 LD L,(IX) ;GET LSB
02290 OR A ;CLEAR CARRY
02300 INST SBC HL,DE ;PERFORM ARITHMATIC
02310 LD (IX+1),H ;STORE MSB
02320 LD (IX),L ;STORE LSB
02330 RET
02340 SBC OR A ;CLEAR CARRY
02350 SBC HL,DE ;SUBTRACT
02360 RET
02370 POS LD D,0 ;MSB=0
02380 LD A,(TXTPOS) ;GET CHAR POSITION
02390 LD E,A ;DE=CHARACTER POSITION
02400 ADD HL,DE ;HL=ADDRESS OF THE CHAR
02410 RET
02420 BLANK LD A,' ' ;ASCII BLANK
02430 LD (DE),A ;CLEAR LAST BYTE
02440 JP COPY ;COPY TEST TO SCREEN
02450 COUNT LD A,(TXTPOS) ;GET CHAR POSITION
02460 LD B,A ;STORE IT
02470 LD A,63 ;GET POS OF RIGHT MARGIN
02480 OR A ;CLEAR CARRY
02490 SBC A,B ;IF CURSOR IS ON R-MARGIN
02500 JP Z,KBOARD ;THEN RESTART
02510 LD C,A ;ELSE C=NUMBER OF CHAR
02520 LD B,0 ;BC=NUMBER OF CHAR
02530 RET
02540 COPY LD HL,(BEGLIN) ;GET CURRENT LINE
02550 LD DE,(SCNLIN) ;GET CURRENT SCREEN LINE
02560 CALL STORE ;STORE THEM BOTH
02570 JP COPYL ;COPY TEXT TO THE SCREEN
02580 COPYL CALL RESTOR ;HL=TEXT RAM,DE=SCREEN
02590 LD BC,64 ;COUNT =64
02600 LDIR ;COPY TEXT TO SCREEN
02610 RET
02620 DITTO LD HL,(SCREEN) ;GET THE SCREEN POINTER
02630 LD DE,3C00H ;GET TOP OF SCREEN MEM
02640 CALL STORE ;STORE BOTH VALUES
02650 CALL COPYL ;COPY TEXT TO SCREEN
02660 CALL STORE ;STORE THE VALUES AGAIN
02670 LD HL,16255 ;LAST SCREEN LOCATION
02680 CALL SBC ;IF WE ARE AT SCREEN END
02690 RET M ;THEN RETURN
02700 CALL RESTOR ;ELSE RETRIEVE POINTERS
02710 LD DE,(TXTEND) ;GET END OF TEXT
02720 CALL SBC ;IF WE ARE NOT AT END
02730 JP M,DT1 ;THEN LOOP TILL DONE
02740 CALL RESTOR ;ELSE RETRIEVE POINTERS
02750 LD DE,HL ;HL=CURRENT SCREEN POS
02760 EX ;CLEAR TILL END OF SCREEN
02770 CLS LD (HL),' ' ;CLEAR A SCREEN BYTE
02780 INC HL ;BUMP THE POINTER
02790 LD A,63 ;GET MSB AT END OF SCREEN
02800 CP H ;IF MSB IS NOT AT END
02810 JR NZ,CLS ;THEN LOOP TILL DONE
02820 LD A,127 ;GET LSB AT END OF SCREEN
02830 CP L ;IF WE ARE AT SCREEN END
02840 RET Z ;THEN RETURN
02850 JR CLS ;ELSE LOOP TILL DONE
02860 CLEAR LD HL,(BEGLIN) ;GET CURRENT LINE
02870 LD B,64 ;COUNT=LENGTH OF LINE
02880 CL1 LD (HL),' ' ;CLEAR A BYTE
02890 INC HL ;BUMP POINTER
02900 DJNZ CL1 ;LOOP TILL DONE
02910 RET
02920 MESSAGE LD HL,3F80H ;GET LAST SCREEN LINE
02930 LD (4020H),HL ;SET ROM CURSOR POSITION
02940 CALL CLEAR+3 ;CLEAR BOTTOM LINE
02950 LD DE,HL ;HL POINTS TO MESSAGE
02960 JP 021BH ;ROM DISPLAY VIDEO LINE
02970 STORE LD (STORE1),HL ;STORE HL
02980 LD (STORE2),DE ;STORE DE
02990 RET
03000 RESTOR LD HL,(STORE1) ;RESTORE HL
03010 LD DE,(STORE2) ;RESTORE DE
03020 RET
03030 INIT LD HL,BEGIN+800H ;GET START OF TEXT RAM
03040 LD (TXTBEG),HL ;SET TEXT BEGINNING

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Listing continued

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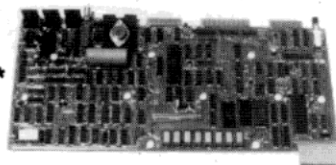
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```

03050 LD (SCREEN),HL
03060 LD (BGLIN),HL
03070 LD HL,3C40H
03080 LD (SCNIN),HL
03090 LD A,B
03100 LD (TXTPOS),A
03110 RET
03120 CON
03130 CALL POS
03140 LD A,(HL)
03150 LD (CCHAR),A
03160 LD A,95
03170 LD (HL),A
03180 RET
03190 COFF
03200 CALL POS
03210 LD A,(CCHAR)
03220 LD (HL),A
03230 LD A,(CHAR)
03240 RET
03250 KWAIT
03260 KB1
03270 CALL
03280 JR
03290 LD
03300 DEC
03310 JR
03320 RET
03330 KB2
03340 POP
03350 JR
03360 KBRD
03370 CALL
03380 CALL
03390 CALL
03400 JR
03410 H2
03420 H1
03430 LD
03440 HELPER
03450 LD
03460 FILE
03470 CALL
03480 LD
03490 LD
03500 LD
03510 LD
03520 F1
03530 CP
03540 JR
03550 CP
03560 JR
03570 CP
03580 JR
03590 JR
03600 SAVE
03610 CALL
03620 CALL
03630 CALL
03640 CLOSE
03650 CALL
03660 JR
03670 CALL

;SET FIRST SCREEN POINTER
;SET CURRENT CURSOR LINE
;GET TOP OF SCREEN MEMORY
;SET FIRST SCREEN LINE
;GET POSITION OF L-MARGIN
;SET CURSOR POSITION
;GET SCREEN POSITION
;GET CURSOR POS ON SCREEN
;GET THE CHAR THERE
;STORE IT
;GET CURSOR CHARACTER
;TURN ON CURSOR
;GET SCREEN LINE
;GET CURSOR POS ON SCREEN
;GET CURSOR CHAR
;PUT CHAR ON SCREEN
;GET KCHAR
;TIMER FOR CURSOR BLINK
;STORE TIME
;ROM KEYBOARD SCAN
;IF CHAR THEN EXIT
;GET TIME
;COUNT DOWN
;LOOP TILL DONE
;STORE KBOARD CHAR
;CLEAR STACK
;TURN OFF CURSOR & RET
;TURN ON CURSOR
;CHECK KEYBOARD
;TURN OFF CURSOR
;CHECK KEY BOARD
;LOOP
;CLEAR STACK
;GET UPPER OR LOWER CASE
;SET UPPER OR LOWER CASE
;POINT TO THE MESSAGE
;PRINT IT ON THE SCREEN
;POINT TO THE MESSAGE
;PRINT IT ON THE SCREEN
;GET UPPER OR LOWER CASE
;STORE IT
;GET CODE FOR UPPER CASE
;MAKE KEYBOARD UPPER CASE
;GET A KEYBOARD CHARACTER
;IF BREAK
;IF SAVE
;IF THEN RETURN
;IF LOAD
;THEN GOTO THE ROUTINE
;OTHERWISE LOOP
;GET FILE SPECIFICATION
;OPEN THE FILE
;CHECK FOR DISK ERROR
;SAVE FILE IN ASCII
;GET DATA CONTROL BUFFER
;CLOSE THE FILE
;CHECK FOR DISK ERROR
;DISPLAY TOP OF SCREEN

;RETURN
;GET FILE SPECIFICATION
;OPEN THE FILE
;CHECK FOR DISK ERROR
;LOAD AN ASCII DISK FILE
;CLOSE THE FILE
;GET START OF TEXT
;STORE IT
;GET CURRENT TEXT POS
;GET CHAR
;GET DATA CONTROL BUFFER
;ROM DISK WRITE
;GET CURRENT TEXT POS
;BUMP POINTER
;STORE THE POINTER
;GET END OF TEXT
;IF WE ARE NOT AT END
;THEN KEEP LOOPING
;THEN KEEP LOOPING
;ELSE RETURN
;GET START OF TEXT
;STORE THE BEGINNING
;GET DATA CONTROL BUFFER
;ROM DISK READ
;IF ERROR THEN JUMP
;GET CURRENT TEXT POS
;STORE THE DISK CHAR
;BUMP TEXT POINTER
;LOOP TILL DONE
;IS IT END OF FILE
;IF NOT THEN GOTO ERROR
;OTHERWISE GET TEXT POS
;SUBTRACT ONE
;SET THE END OF TEXT
;POINT TO MESSAGE
;PRINT THE MESSAGE
;POINT TO BUFFER
;ALLOW 12 CHARACTER INPUT
;IF BREAK THE RETURN
;TRANSFER BUFFER TO DCB
;GET BUFFER
;GET DATA CONTROL BUFFER
;SPECIFY 256 BYTE RECORDS
;BOTTOM SCREEN LINE
;SET CURSOR TO BOTTOM
;STORE DISK ERROR CODE
;RETRIEVE ERROR CODE
;SPECIFY RETURN TO CALLER
;PRINT ERROR MESSAGE
;GET KEYBOARD INPUT
;IF NOT BREAK
;THEN LOOP
;ELSE RETURN
;SOURCE = BUFFER
;DESTINATION = DCB
;COUNT=50
;TRANSFER FILESPEC TO DCB
;EXECUTION LOCATION
BEGIN+406

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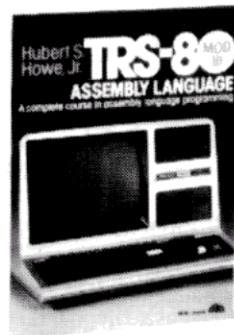
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by John Ratzlaff

I

f you want to find out where a machine-language program loads in RAM

or how much memory it takes up, you have to know the file's load addresses. DOSPLUS and LDOS for the Model III provide address mapping utilities, but Model 4 DOSes don't. That leaves Model 4 users with no choice but to search files by hand for load addresses. I've developed a Model 4 address mapping utility called MAD (mapped addresses) that does the job for you.

MAD displays the load addresses of the blocks in a load module. A load module is a disk file that contains code you load in memory and execute, usually as a machine-language program. Using the utility, you can determine where these programs load, where they execute, and how much memory they occupy.

For instance, you can discover that Microsoft Basic, included with TRSDOS 6.X, loads from 3000-81FF hexadecimal (hex) and begins execution at 7F0C hex. You can also learn that the BE1 Basic enhancements package supplied with DOSPLUS IV consists of many little sections of code that overwrite Microsoft Basic, as well as one or two large sections of code.

Program Notes

I wrote MAD using the M-ZAL assembler and TED text editor that come with DOSPLUS IV/A for the Model 4. It works under TRSDOS 6.X or DOSPLUS IV because it uses supervisory calls common to both operating systems.

You execute the program at the DOS level by typing in MAD followed by the name of a load module file. For

example, MAD will display its own load addresses if you type in MAD MAD. The resulting display is:

```
2400-258F
Exec = 2400
```

This tells you that the MAD/CMD program loads from 2400-258F hex and executes at 2400 hex. If you don't enter a file name extension, the utility automatically adds the /CMD extension since that's the one most load module files use. You can specify another extension, too, as in MAD LE-SCRIPT/DVR.

Under TRSDOS 6.X, system files (such as Basic) have their own passwords—they're listed in the technical manual. To use the MAD program with these files, you must type in the password; for example, MAD BASIC/CMD.BASIC.

Load Module Format Explained

The load module format is one aspect of the TRS-80 line that has remained fairly constant from DOS to DOS and from the Model I to the Model 4. The standard format specifies that the file be in blocks, each of which begins with a byte identifying the type of block.

Traditionally, the format comprises three types of blocks. Comment blocks identify the purpose of the file and are not loaded into memory. Object code blocks contain the actual program code and the address at which the computer starts loading that code. Execution (transfer-address) blocks specify the transfer address of a machine-language program.

Recently, several new block types have been included in the standard.

The traditional comment block sometimes contains only the file name, while another new type of comment block contains other notation, such as copyright or authorship information.

Another new block is the patch block. Like a comment block, it identifies the object code block that follows it as a patch. When you remove a patch using the DOS's Yank function, the patch code is not removed; instead, the object code block gets a new block identifier byte telling the DOS loader to ignore that block.

All blocks begin with a block identifier byte (see the Table): 05 indicates a comment block, 01 an object code block, 02 an execution address block, and 07 a patch block. After the identifier byte comes a byte indicating the number of bytes to follow in the block. The remaining bytes contain information about the program or code you want to load.

For example, an entire comment block might look like this: 05 06 53 43 52 49 50 54. The 05 byte identifies the block as a comment block. The 06 tells you that 6 bytes will follow; those 6 bytes contain the first six letters of the file name, SCRIPT in this case. A sample execution block is: 02 02 00 70, where the execution address is 7000 hex.

In an object code block, the 2 bytes

The Key Box



Model 4
64K RAM
Basic
Assembly Language
Editor/Assembler
TRSDOS 6.X or DOSPLUS IV

that follow the length-of-block byte define the address where the computer should load the code. Take, for example, a block containing these bytes: 01 04 00 F0 F3 C9. The 01 indicates an object code block; the 04 means 4 bytes will follow; the 00 and F0 bytes are the address (F000 hex); therefore, the two remaining bytes, F3 and C9, load at F000 and F001 hex.

Usually, when the operating system loads large sections of code, their blocks are contiguous so they load one after another in memory. Such blocks might start with the bytes 01 00 00 30, etc. This block would load FE hex, or 254 bytes of code because the length-of-block byte is 00, which really means 256, and the address takes up two of those bytes.

Sometimes you'll see an object code block that begins like this: 01 02 00 30, etc. At first, you might think this block indicates no code is included, because the length-of-block byte is 02, which leaves room only for the address bytes. However, when you subtract the address byte's 2 bytes from the length-of-block byte, you get 00, indicating 256 bytes will follow in the block.

Each load module file should contain only one execution block, and that block must be at the end. It's theoretically possible to have more than one execution block, but the DOS program loader won't load any blocks after the first execution block. Therefore, the MAD program ends following an execution block. If the program finds no execution block, or if it locates a block with an identifier byte other than those listed in the Table, it aborts with a "Load File Format Error" message.

Program Listing 2 is the MAD utility in Basic—it's much slower than the Assembly-language program, of course. You can figure out the logic of the routine by looking at the Basic program. I used DOSPLUS Enhanced Basic, which allows labeled addressing. To convert it to standard TRS-DOS Basic, remove all the Name commands and replace the labels in the GOTO statements with the appropriate line numbers. ■

John Ratzlaff is a math teacher. You can write him at Mount Pisgah Academy, Candler, NC 28715.

Byte	Description	Byte	Description
01	Object code block	07	Patch (comment) block
02	Execution address block	10	Yanked patch object code block
05	Comment or file name block	1F	Comment block

Table. Block identifier bytes.

Program Listing 1. Assembly-language version of address mapping utility.

```

00100 ;MAD/ASM by John Ratzlaff 02/19/84
00110 ;
00120 ;Displays load addresses of load-module-format disk files.
00130 ;Executed by typing MAD FILENAME or MAD FILENAME/CMD from DOS.
00140 ;(Default extension is CMD).
00150 ;Works on TRS-80 Model 4 under DOSPLUS IV or TRSDOS 6.x
00160 ;
00170 ORG 2400H
00180 START LD DE,FCB
00190 LD A,4EH ;@FSPEC
00200 RST 28H ;GET FILESPEC AND PUT IN FCB
00210 JR Z,OK
00220 CP 0DH ;CR INDICATES NO FILENAME ENTERED
00230 LD HL,MSG5 ;'Filename required'
00240 JR Z,SKIP4
00250 LD HL,MSG6 ;'Improper filename'
00260 SKIP4 CALL MSG
00270 JP DOS
00280 OK LD DE,FCB
00290 LD HL,EXT
00300 LD A,4FH ;@FEXT
00310 RST 28H ;ADD /CMD EXTENSION IF NONE PRESENT
00320 LD DE,FCB
00330 LD B,0 ;LRL
00340 LD HL,BUFF
00350 LD A,3BH ;@OPEN
00360 RST 28H ;OPEN FILE
00370 JP NZ,ERROR
00380 MAIN CALL GET ;GET BLOCK IDENTIFIER BYTE
00390 CP 5
00400 JR Z,COMENT ;COMMENT BLOCK
00410 CP 1FH
00420 JR Z,COMENT
00430 CP 1
00440 JR Z,BLOCK ;OBJECT CODE BLOCK
00450 CP 10H
00460 JR Z,BLOCK ;YANKED PATCH OBJECT CODE BLOCK
00470 CP 2
00480 JR Z,EEXEC ;EXECUTION ADDRESS BLOCK
00490 CP 7
00500 JP Z,PATCH ;PATCH BLOCK
00510 ABORT LD HL,MSG1 ;LOAD FILE FORMAT ERROR
00520 CALL MSG
00530 CALL CLOSE ;CLOSE FILE
00540 JP DOS ;GO TO DOS
00550 COMENT LD A,(FLAG)
00560 OR A
00570 CALL NZ,SHWEND
00580 COMM1 CALL GET ;GET # OF BYTES IN BLOCK
00590 LD B,A
00600 CALL GET ;GET COMENT BYTE
00610 CALL DSP ;DISPLAY IT
00620 DJNZ CLOOP
00630 CALL CR ;PRINT CR
00640 JR MAIN ;GO BACK TO MAIN LOOP
00650 BLOCK CALL GET ;GET BLOCK LENGTH
00660 LD B,A
00670 CALL GET ;GET BLOCK LOAD ADDRESS
00680 LD L,A
00690 CALL GET
00700 LD H,A
00710 CALL CPBLY ;COMPARE HL,IY
00720 JR Z,SKIP2 ;SAME ADDR - DON'T DISPLAY OLD ADDR.
00730 LD A,(FLAG)
00740 OR A
00750 CALL NZ,SHWEND
00760 SKIP2 LD A,(FLAG)
00770 OR A
00780 JR NZ,SKIP3
00790 PUSH HL ;TRANSFER HL TO DE
00800 POP DE
00810 PUSH DE ;SAVE ADDRESS IN IY
00820 POP IY
00830 CALL HEX ;DISPLAY BLOCK START ADDRESS
00840 LD HL,MSG2 ;' - '
00850 CALL MSG
00860 SKIP3 DEC B ;COMPENSATE FOR ADDRESS BYTES

```

Listing 1 continued

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Listing 1 continued

```

00830      DEC      B
00840      CALL    GET      ;GET BYTE AND THROW IT AWAY
00850      BLOOP   INC      IY      ;UPDATE ADDRESS COUNTER
00860      DJNZ    BLOOP   ;LOOP FOR ALL BYTES IN BLOCK
00870      LD      A,1      ;SET FLAG
00880      LD      (FLAG),A
00890      JR      MAIN     ;GO BACK TO MAIN LOOP
00900      EXEC    LD      A,(FLAG)
00910      OR      A
00920      CALL    NZ,SHWEND
00930      CALL    GET      ;HOW MANY BYTES IN BLOCK?
00940      CP      2      ;SHOULD BE 2, OR ELSE!
00950      JR      NZ,ABORT
00960      LD      HL,MSG3
00970      CALL    MSG
00980      CALL    GET      ;GET EXECUTE ADDRESS
00990      LD      E,A
01000      PUSH    DE      ;PRESERVE E
01010      CALL    GET
01020      POP     DE
01030      LD      D,A
01040      CALL    HEX      ;DISPLAY ADDRESS
01050      CALL    CR
01060      CALL    CLOSE   ;CLOSE FILE
01070      JR      DOS     ;ALL FINISHED!
01080      PATCH   LD      A,(FLAG)
01090      OR      A
01100      CALL    NZ,SHWEND
01110      LD      HL,MSG4
01120      CALL    MSG
01130      JP      COMM1   ;JUMP INTO COMMENT ROUTINE
01140      MSG     LD      A,0AH
01150      RST      28H
01160      RET      Z
01170      POP     HL
01180      JR      ERROR
01190      CPHLYI   PUSH    DE      ;SAVE DE
01200      PUSH    IY      ;TRANSFER IY TO DE
01210      POP     DE
01220      LD      A,H
01230      CP      D
01240      JR      NZ,SKIP1
01250      LD      A,L
01260      CP      E
01270      SKIP1  POP     DE      ;RESTORE DE
01280      RET
01290      SHWEND  PUSH    HL      ;SAVE HL
01300      PUSH    IY      ;TRANSFER IY TO DE
01310      POP     DE
01320      DEC     DE
01330      CALL    HEX      ;DISPLAY END ADDRESS OF
CONTIGUOUS BLOCK
01340      CALL    CR
01350      XOR     A      ;CLEAR FLAG
01360      LD      (FLAG),A
01370      POP     HL
01380      RET
01390      CLOSE   LD      DE,FCB
01400      LD      A,3CH   ;@CLOSE
01410      RST      28H
01420      RET      Z
01430      POP     HL
01440      JR      ERROR
01450      DOS     LD      HL,0
01460      EXIT    LD      A,16H
01470      RST      28H   ;@EXIT
01480      ERROR   LD      C,A   ;JUMP TO DOS
01490      SET     6,C      ;"NORMAL" ERROR MESSAGE
01500      LD      A,1AH   ;@ERROR
01510      RST      28H   ;RETURNS TO DOS AFTER DISPLAYING
ERROR
01520      GET     LD      DE,FCB
01530      LD      A,3     ;@GET
01540      RST      28H
01550      RET      Z
01560      POP     HL
01570      JR      ERROR
01580      DSP     LD      C,A
01590      LD      A,2     ;@DSP
01600      RST      28H
01610      RET      Z
01620      POP     HL
01630      JR      ERROR
01640      CR      LD      A,0DH   ;DISPLAY A CARRIAGE RETURN
01650      JR      DSP
01660      HEX     LD      HL,HEXBUF
01670      LD      A,63H   ;POINT TO BUFFER FOR ASCII
01680      RST      28H   ;@HEX16
01690      LD      HL,HEXBUF
01700      JR      MSG     ;DISPLAY ASCII
01710      MSG1    DEFM    'Load file format error'
01720      DEFB     0DH
01730      MSG2    DEFM    ' - '
01740      DEFB     3
01750      MSG3    DEFM    'Exec = '
01760      DEFB     3

```

Listing 1 continued

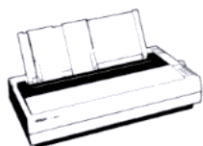
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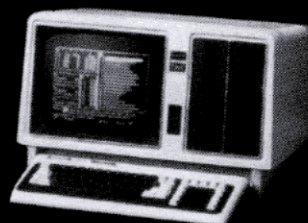
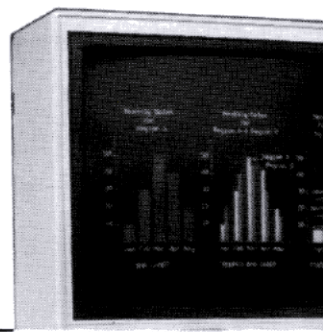
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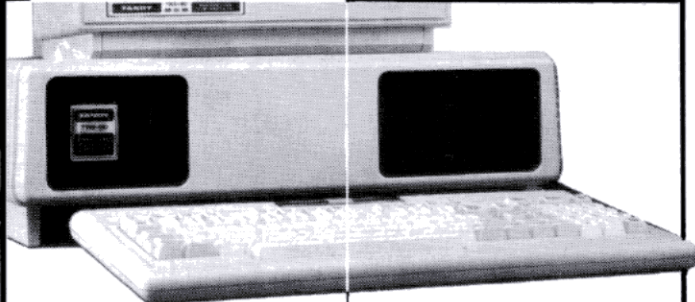
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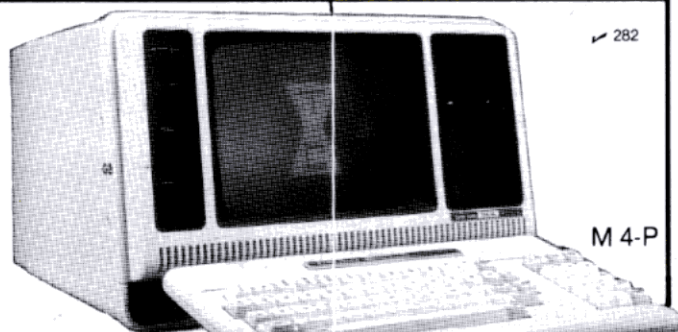
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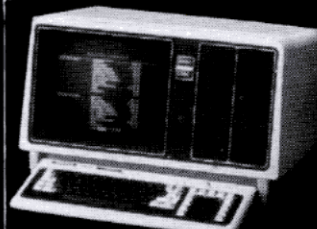
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Listing 1 continued

```
01770 MSG4      DEFM      'Patch = '
01780           DEFB      3
01790 MSG5      DEFM      'Filename required'
01800           DEFB      0DH
01810 MSG6      DEFM      'Improper filename'
01820           DEFB      0DH
01830 FLAG      DEFB      0
01840 HEXBUF    DEFW      0
01850           DEFW      0
01860           DEFB      3
01870 EXT       DEFM      'CMD'
01880 FCB        DEFS      32
01890 BUFF       DEFS      256
01900           END      START
01920 MSG2      DEFM      ' - '
01930           DEFB      3
01940 MSG3      DEFM      'Exec = '
01950           DEFB      3
01960 MSG4      DEFM      'Patch = '
01970           DEFB      3
01980 MSG5      DEFM      'Filename required'
01990           DEFB      0DH
02000 MSG6      DEFM      'Improper filename'
02010           DEFB      0DH
02020 FLAG      DEFB      0
02030 HEXBUF    DEFW      0
02040           DEFW      0
02050           DEFB      3
02060 EXT       DEFM      'CMD'
02070 FCB        DEFS      32
02080 BUFF       DEFS      256
02090           END      START
```

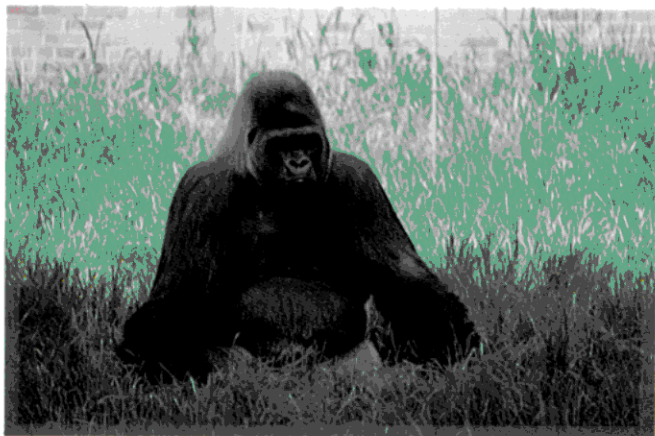
End

Program Listing 2. Basic version of address mapping utility.

```
0 'MAD/BAS by John Ratzlaff
10 ON ERROR GOTO TROUBLE
20 INPUT"Filename";F$:F$=F$+"/CMD"
30 OPEN"I",1,F$:CLOSE 1
40 OPEN"R",1,F$,1:FIELD 1,1 AS A$
50 '
60 NAME MAINLOOP:GET 1:A=ASC(A$)
70 IF A=5 OR A=31 THEN GOTO COMMENT
80 IF A=1 OR A=16 THEN GOTO BLOCK
90 IF A=2 THEN GOTO EXEC
100 IF A=7 THEN GOTO PATCH
110 '
120 NAME ABORT
125 PRINT"* Load file format error! *"
130 CLOSE:END
140 '
150 NAME COMMENT
155 IF FLAG THEN PRINT HEX$(C0-1):FLAG=0
160 GET 1:B=ASC(A$)
170 FOR J=1 TO B:GET 1:PRINT A$;:NEXT:PRINT
180 GOTO MAINLOOP
190 '
200 NAME BLOCK
210 GET 1:B=ASC(A$):IF B=0 THEN B=256
220 GET 1:C=ASC(A$):GET 1:C=C+256*ASC(A$)
230 IF FLAG AND C<>C0 THEN PRINT HEX$(C0-1):FLAG=0
235 IF NOT FLAG THEN PRINT HEX$(C) - ";:C0=C
240 B=B-2:IF B=0 THEN B=256
250 FOR J=1 TO B:GET 1:C0=C0+1:NEXT
255 FLAG=-1:GOTO MAINLOOP
260 '
270 NAME EXEC
275 IF FLAG THEN PRINT HEX$(C0-1):FLAG=0
280 GET 1:B=ASC(A$):IF B<>2 THEN GOTO ABORT
290 GET 1:C=ASC(A$):GET 1:C=C+256*ASC(A$)
300 PRINT"Exec = "HEX$(C)
310 CLOSE:END
320 '
330 NAME PATCH
335 IF FLAG THEN PRINT HEX$(C0-1):FLAG=0
340 GET 1:B=ASC(A$):PRINT"Patch = ";
350 FOR J=1 TO B:GET 1:PRINT A$;:NEXT:PRINT
360 GOTO MAINLOOP
370 '
380 NAME TROUBLE
390 IF ERR=53 THEN PRINT"* File not found! *":END
400 ON ERROR GOTO 0
```

End

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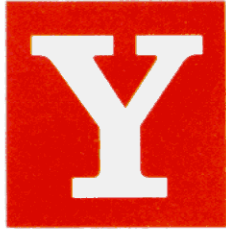




Eliminate your Basic program's garbage-collection delays with these routines.

Quit Stalling

by Thomas P. Eggarter



You're running a program and suddenly the screen freezes. You press a key or two. Nothing happens. You try the break key. Still nothing. These are the telltale signs of garbage collection, an internal housekeeping routine that temporarily takes control of your computer system. You can regain control only by pressing the reset button and aborting the program. Otherwise, you just have to wait for the program to resume execution on its own.

Garbage collection delays occur when you use large amounts of string memory. Fortunately, it's possible to eliminate those delays and dramatically cut program execution time.

How Long Do I Have to Wait?

Program Listing 1 illustrates how garbage collection can slow your computer down. The program creates a string array dimensioned to hold 1,000 elements, each a single random letter. Phase 1 of the program assigns values to the array; the screen displays the starting and ending times for the procedure so you can see how long it takes.

Phase 2 loops 100 times between lines 90 and 120, executing some simple string operations and again displaying the starting and ending times.

When you run the program, you'll notice delays of about two minutes for every 17 or so executions of the loop. During those delays, garbage collection is taking place.

When the program ends, your screen should look like Fig. 1. Execution time is 11 minutes, even though the program itself takes only a few seconds to process. This example isn't an

aberration; whether you load strings from main memory or from a disk file, and no matter what operations you perform on them, garbage collection still occurs.

Saving Strings

To understand what causes garbage collection, you need to know something about how Basic uses memory for string operations. In line 20 of Listing 1, the statement `CLEAR 1500` reserves 1,500 bytes of memory. The highest address of this string area is the number you enter in response to the memory size prompt when you get into Basic. The computer stores this number in memory locations 16,561 and 16,562 in standard 2-byte format. To determine the number, type in `PEEK(16561)+256*X*PEEK(16562)`.

Memory locations 16,544 and 16,545 store the lowest address of string memory minus 1. A third relevant address, the first free string location, is stored at 16,598 and 16,599.

Program Listing 2 demonstrates how Basic uses string memory during program execution. Line 10 reserves 64 bytes of memory for string operations. Lines 20-40 display the lowest and highest addresses of this string area, as well as the first free location.

Lines 50-70 let you see on a single screen line what data the system keeps in string memory (unused areas are displayed as X's). Line 80 lets you input a value for the variable X\$. The program then returns to line 30 and updates the display, after which you can enter another value for X\$, and so on.

Run the program and type in `FIRST STRING` as the first value for X\$. Type in `SECOND STRING` the second time, and `THIRD STRING`

the third time. The screen should look like Fig. 2.

Note that the old values aren't erased as you assign new values to X\$. Instead, the computer uses string memory the way you'd use a sheet of paper if you had no eraser. It stores the values sequentially until it runs out of room.

Keep entering new values for X\$. When you use up all the string memory, the system erases obsolete data and packs all active strings toward the top of the string area. This is the garbage collection process.

Now for an explanation of what happens when you run Listing 1. After the program assigns values to `AS(I%)`, 500 bytes of string space remain. In manipulating X\$ and Y\$, the program uses up that space after about 17 executions of the loop.

When the string memory area becomes full, the system tries to erase obsolete data and clear space by packing the 1,002 active strings together near the top of memory. In this case, no obsolete values exist, but the checking process takes time.

Making a Switch

Two characteristics of string storage point the way to a solution of the garbage collection problem. First, the computer doesn't store every string in

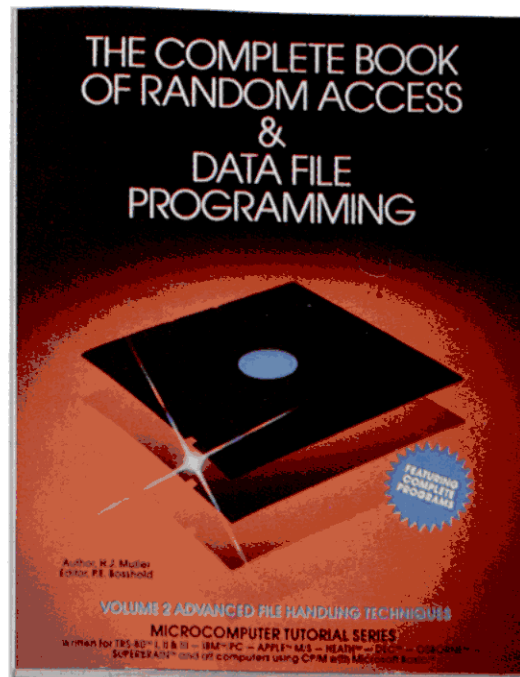
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the string area. For example, add this line to Listing 2:

```
15 Y$="STRING DEFINED IN PROGRAM"
```

You won't see Y\$ displayed on the screen, because it's not stored in the

reserved string memory area.

Second, the computer manipulates only the strings inside the string area during garbage collection. Therefore, if you could get the values for A\$ in Listing 1 to reside outside string memory, the memory area wouldn't fill up,

and the computer wouldn't call the garbage collection routine.

One solution is to put the values inside the program in data statements and use Basic's editing features to update your data. While that approach might work in some applications, it's not practical for others. When sorting a file, for example, you can't easily convert the sort keys into data statements. An alternative is to protect enough high memory to accommodate all keys, and move them to that area as the computer reads them from disk.

There's a simpler way—redefining the top of protected memory during execution, thereby hiding the string values from the garbage collector. To see how this works, add these lines to Listing 1:

```
62 B1=PEEK(16561):B2=PEEK(16562)
65 POKE 16561,PEEK(16598):POKE 16562,
   PEEK(16599)
135 POKE 16561,B1:POKE 16562,B2
```

Line 65 is the important one. Executed after the 1,000 A\$(I%) values are in place, it takes the first free location (1,000 bytes below the top and 500 bytes above the bottom of the reserved memory area) and makes it the new top of the string area.

When the system calls the garbage collector routine, it reads the top-of-memory address from 16,561 and 16,562 and determines that it must clear only 500 bytes. The routine therefore works on only two strings (X\$ and Y\$), leaving A\$(I%) alone.

Lines 62 and 135 restore the original top of memory. You can omit them if you reset the system before each program run.

Try running Listing 1 again with the three new lines. Look at the new execution time for the loop in lines 90–120. It drops from 11 minutes to five seconds!

Other Maneuvers

Sometimes you can't input large arrays at the beginning of a program. But you can still trick the garbage collector by defining null strings of the appropriate length at initialization, and using LSET (which doesn't change string addresses) to assign values to these strings.

Program Listing 3, which contains a loop that alternates assigning 1,000

Program Listing 1. Demonstration of garbage collection delays in a simple string operation loop.

```
10 CLS:PRINT TAB(9);"**** GARBAGE COLLECTOR DEMONSTRATION ****":PR
INT:PRINT:PRINT
20 CLEAR 1500:DIM A$(1000)
30 PRINT "PHASE 1 : ASSIGN VALUES TO 1000 STRINGS"
40 PRINT "START : ";RIGHT$(TIME$,8);
50 FOR I%=1 TO 1000:A$(I%)=CHR$(64+RND(26)):NEXT I%
60 PRINT "      END : ";RIGHT$(TIME$,8):PRINT:PRINT
70 PRINT "PHASE 2 : EXECUTE SIMPLE STRING OPERATIONS 100 TIMES"
80 PRINT "START : ";RIGHT$(TIME$,8);
90 FOR I%=1 TO 100
100 X$=TIME$:Y$=RIGHT$(X$,8)
110 PRINT@960,I%,Y$,A$(I%);
120 NEXT I%
130 PRINT@960,CHR$(31);PRINT @597," END : ";RIGHT$(TIME$,8);
140 PRINT:PRINT:END
```

End

**** GARBAGE COLLECTOR DEMONSTRATION ****

PHASE 1 : ASSIGN VALUES TO 1000 STRINGS
START : 00:03:18 END : 00:03:34

PHASE 2 : EXECUTE SIMPLE STRING OPERATIONS 100 TIMES
START : 00:03:34 END : 00:16:32

Figure 1. Screen display after Program Listing 1 runs.

Program Listing 2. Demonstration of string memory management.

```
10 CLS:CLEAR 64
20 PRINT@8, "**** STRING MEMORY MANAGEMENT DEMONSTRATION ****"
30 TM=PEEK(16561)+256*PEEK(16562):
   FF=PEEK(16598)+256*PEEK(16599):
   BM=PEEK(16544)+256*PEEK(16545)+1
40 PRINT@128, "Top of string memory   =";TM:
   PRINT "First free location   =";FF:
   PRINT "Bottom string memory  =";BM
50 PRINT:PRINT "Memory contains :":PRINT
60 FOR I=BM TO TM:IF I<=FF THEN PRINT "x";
   ELSE I1=I+(65536)*(I>32767):PRINT CHR$(PEEK(I1));
70 NEXT I
80 X$="":PRINT @640,CHR$(31);:INPUT "Input any data string ";X$
90 GOTO 30
```

End

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2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKVEN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWTH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEplete	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFOT	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model
53 FQEQWSH	As above but with shortages permitted
54 FQEQQPB	As above but with quantity price breaks
55 QUEJECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBJD	DOE business bookkeeping system
77 TIMECLK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMJAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
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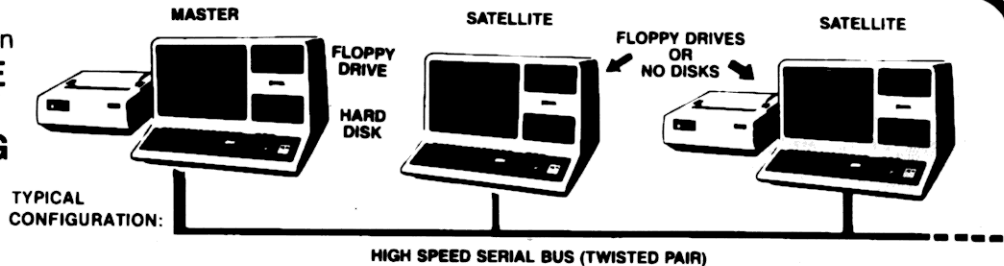
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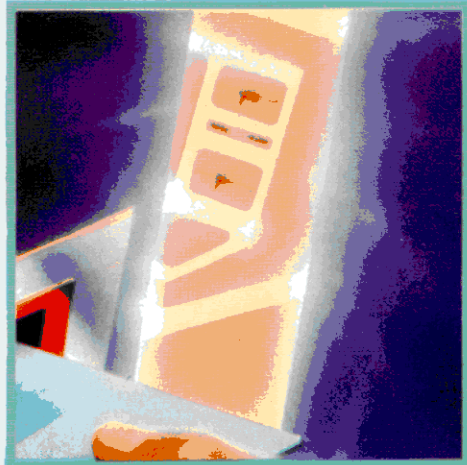
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Tape Check gives you something Radio Shack's Series I Editor/Assembler doesn't—a utility that checks for errors generated in transferring source code from EDTASM's buffer to tape.

Tape Me, I'm Yours

by Jay Walton

Radio Shack's Series I Editor/Assembler doesn't verify source code you record from the EDTASM to tape. Since you can't tell whether or not EDTASM saves a source file properly, you could end up with a long source file that glitched as you saved it to tape.

Tape Check, my Assembly-language code verification program, checks for a valid source file save (see the Program Listing). It works with a Series I Editor/Assembler and your 48K RAM tape-based Model III.

Tape Check reads the Assembly-language source code saved on your cassette and checks it against the source code in the EDTASM source buffer. The program tells you when it detects a discrepancy, allowing you to immediately rewind the tape to try and record an error-free version of the source code.

Using Tape Check

Tape Check resides from 0FE00-0FF23 hexadecimal (hex) with an entry point of 0FE96 hex, leaving room for your source program. You can relocate Tape Check by changing the ORG value in line 400 of the Program Listing.

You must load EDTASM in memory before you load Tape Check. The program changes the EDTASM tape vectors for the Model I/III ROM to let Model III users save source code at 1,500 baud. EDTASM cannot save object code at 1,500 baud, however.

Line 390 prevents EDTASM from writing its symbol table over Tape Check.

To run Tape Check, load EDTASM and then load Tape Check.

Type in SYSTEM, hit the enter key, and type in /19434 to access the EDTASM entry point. You can now key in or load your source program.

After recording a source file to tape, exit to Basic. Executing the Q command, normally the EDTASM exit command, results in a system vector loss to Tape Check due to the required reinitialization. Rather than use the Q command, type in L, hit the enter key twice, then hit the break key. This returns control to the Basic command mode and retains the system vector to Tape Check. Once you're in Basic, type in POKE 16913,1 to get the high baud rate.

You can reenter EDTASM at 4BF6 hex (19446 decimal) without destroying the resident source program. To do so, type in SYSTEM, hit the enter key, then type in /19446. To enter Tape Check from Basic, type in SYSTEM, hit the enter key, and hit the slash key (/) followed by the enter key.

When you've entered Tape Check, it prompts you to prepare the cassette and select the high or low baud rate (a high baud rate is the default).

After you respond to the cassette prompt, Tape Check displays a verifying message (a blinking asterisk) and the source file name (if you specified one), indicating that it's checking the newly taped program.

Tape Check displays a message if any errors occur during verification and lets you recheck the tape. If you still don't get a positive verification, you must save the source code again.

To do this, respond to the cassette prompt, press the break key, and enter the Basic command mode. Then reenter EDTASM and save the source code to tape again. If the save is error-free, Tape Check displays the message

"Tape Okay" and returns to the EDTASM reentry point.

Source Buffer Structure

EDTASM's source code buffer starts at 6311 hex and ends with 2 0FF hex bytes. It stores each line of source code in the following format: the first 2 bytes represent the binary line number in least significant byte/most significant byte (LSB/MSB) format. The third byte represents the total number of ASCII bytes and control bytes. The bytes following this third byte are the actual ASCII and control bytes. The control byte (09 hex) represents the tab commands between source code fields.

Source File Structure

The source file created for tape consists of 255 zero bytes and a 0A5 hex synchronization byte as the file leader. An ASCII S with bit 7 on (0D3 hex) follows the file leader. The program then stores the file name specified during the save.

Each line of source code records to tape as a 5-byte line number field followed by one 09 hex byte. The line number is the ASCII representation of the source code number (with bit 7 of each byte on).

For example, the ASCII representation for the source code line number 00110 is 30H 30H 31H 31H 30H. With bit 7 on, it records as B0H B0H B1H

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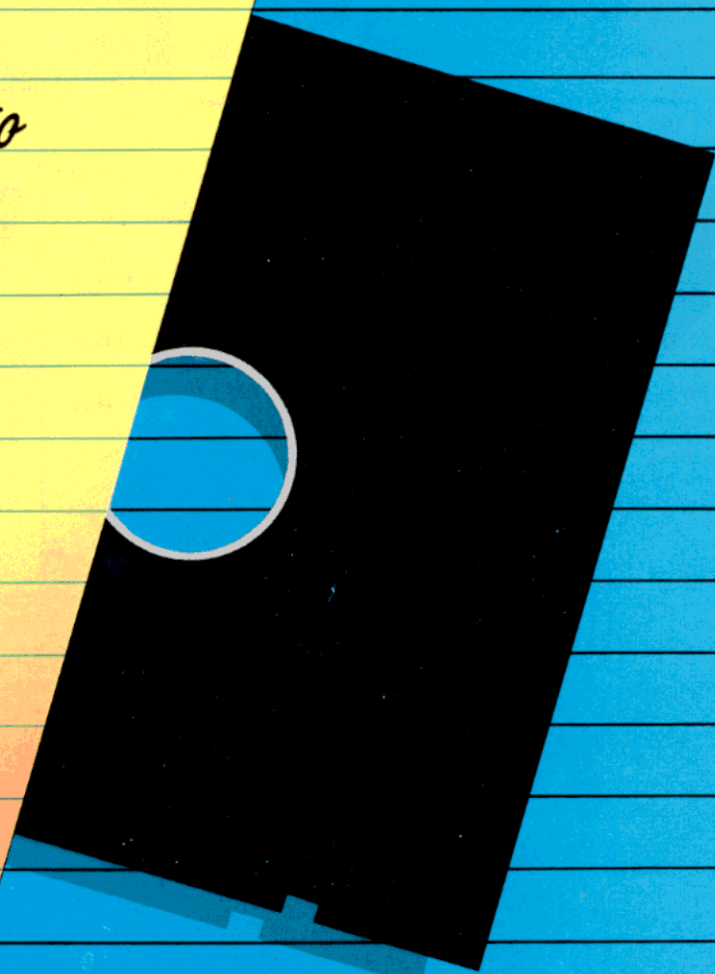
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B1H B0H. The ASCII text then follows with the embedded tab control codes (09H).

Each line terminates with a carriage return code (C/R, 0DH) and the sequence repeats. A 1A hex file terminator flag byte follows the last C/R code. The program doesn't use a checksum.

Verification Errors

Errors encountered during verification are often due to an improper cassette output setting. Try readjusting the cassette output level and then re-verifying the source code.

If you still don't receive a "Tape Okay" message on verification, re-

cord the source file on a new tape or erase the original tape and record again. ■

You can write to Jay Walton at 112 Island Drive, Richardson, TX 75081.

Program Listing. Tape Check program for verifying source code tapes.

```

00100 ; VERIFY SOURCE (TAPE CHECK) VERSION 1.1
00110 ; BY JAY WALTON
00120 ;
4646 00130 EDTASM EQU 4646H ;FIRST ADDRESS OF EDTASM
468F 00140 TPEVEC EQU 468FH ;EDTASM TAPE VECTORS
0296 00150 FND5YC EQU 296H ;FIND LEADER AND SYNC
0235 00160 RDBYTE EQU 235H ;READ A TAPE BYTE
0287 00170 WRTSYC EQU 287H ;WRITE SYNC BYTE TO TAPE
0264 00180 WRTBYT EQU 264H ;WRITE A BYTE TO TAPE

```

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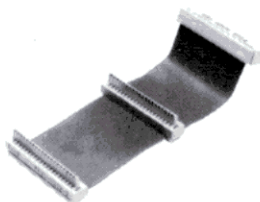
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```
10 ' generate prime nu
20 '
30 DEFINT A-Z
40 PRINT TIMES
50 S=7000
60 DIM P(7001)
70 C=0
80 FOR I=1 TO S
90 P(I)=1
100 NEXT I
110 FOR I=0 TO S
120 IF P(I)=0 THEN 200
130 P=I+1+3
140 K=I+P
150 IF K>S THEN 190
160 P(K)=0
170 K=K+P
180 GOTO 150
190 C=C+1
200 NEXT I
210 PRINT C, 'pri
220 PRINT TIMES
230 END
```

8
36) 2000 (58)
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Listing continued

```
28A7 00190 VDLIN EQU 28A7H ;WRITE (HL) TO VIDEO
0033 00200 VDCHAR EQU 33H ;DISPLAY CHARACTER IN A
01C9 00210 VDCLS EQU 1C9H ;CLEAR DISPLAY
3042 00220 CASS EQU 3042H ;<H/L> CASS PROMPT
6311 00230 EDTBUF EQU 6311H ;STRT OF EDTASM SRCE BUFF
01F8 00240 CASOFF EQU 1F8H ;TURN OFF CASSETTE
4020 00250 CURPOS EQU 4020H ;DCB CURSOR POSITION
4C2A 00260 EDTRET EQU 4C2AH ;EDTASM RE-ENTRY POINT
001A 00270 ENDFLG EQU 26 ;SOURCE TAPE END FLAG
00D3 00280 HDRBYT EQU 211 ;'S' WITH BIT 7 ON
0009 00290 NUMTRM EQU 9 ;NUMBER STRING TERMINATOR

468F 00310 ORG TPEVEC ;POINT TO EDTASM TPE VEC.
468F C39602 00320 JP FNDSYC ;USE MODEL III ROM
4692 C33502 00330 JP RDBYTE ;ROUTINES
4695 C38702 00340 JP WRTSYC ;FOR TAPE
4698 C36402 00350 JP WRTBYT ;OPERATIONS
469B C3F801 00360 JP CASOFF ;AND CONTROL

4BF9 00370 ORG 4BF9H
4BF9 11FFFD 00380 LD DE,VERCHK-1
FE00 00400 ORG 0FE00H ;OBJECT LOAD POINT

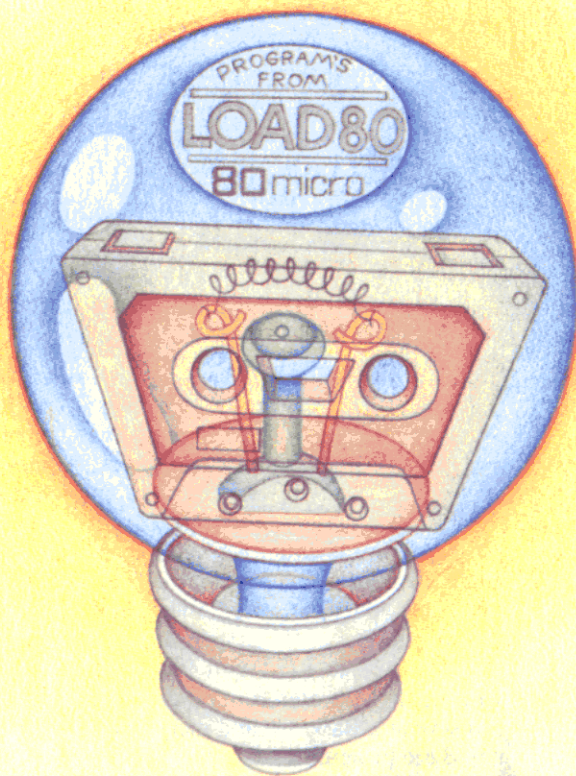
00410 ;
00420 *LIST OFF
00570 *LIST ON

FE96 314646 00580 TPECHK LD SP,EDTASM ;STACK BELOW EDTASM
FE99 CDC901 00590 CALL VDCLS ;CLEAR DISPLAY
FE9C 2128FE 00600 LD HL,READY ;POINT TO CASSETTE READY
FE9F CDA728 00610 CALL VDLIN ;WRITE IT
FEA2 CD4230 00620 ENTRY CALL CASS ;Cass? PROMPT <H/L>
FEA5 3E0F 00630 LD A,0FH ;OFF CURSOR CHARACTER
FEA7 CD3300 00640 CALL VDCHAR ;WRITE IT
FEAA 2153FE 00650 LD HL,VERIFY ;POINT TO VERIFY MESSAGE
FEAD CDA728 00660 CALL VDLIN ;WRITE IT
FEB0 2A2040 00670 LD HL,(CURPOS) ;GET CURSOR POS AFTER MSG
FEB3 DD211163 00680 LD IX,EDTBUF ;POINT TO EDTBUF START
FEB7 CD9602 00690 CALL FNDSYC ;FIND TAPE SYNC PULSE
FEB8 CD3502 00700 CALL RDBYTE ;READ BYTE FOR 'S' W/B 7
FEBD FED3 00710 CP HDRBYT ;IS IT 'S' W/B 7 ON?
FEBF 204C 00720 JR NZ,ERROR ;IF NOT, GO WRITE ERROR
FEC1 0606 00730 LD B,6 ;GET READY FOR 6 BYTE NME
FEC3 CD3502 00740 NAME CALL RDBYTE ;GET CHARACTER OF NAME
FEC6 77 00750 LD (HL),A ;PUT IT ON DISPLAY
FEC7 23 00760 INC HL ;BUMP DISPLAY POINTER
FEC8 10F9 00770 DJNZ NAME ;DO AGAIN FIVE MORE TIMES
FECA CD3502 00780 GETNXT CALL RDBYTE ;GET NEXT BYTE
FECD FE1A 00790 CP ENDFLG ;IS IT ENDFLG?
FECF 2847 00800 JR Z,TERM ;IF SO, END VERIFY
FED1 210000 00810 LD HL,0 ;ELSE, INITIALIZE ACCUM.
FED4 0605 00820 LD B,5 ;WE WILL GET FIVE BYTES
FED6 54 00830 LINENO LD D,H ;MOVE ACCUM VALUE TO DE
FED7 5D 00840 LD E,L ;DE = HL
FED8 29 00850 ADD HL,HL ;DOUBLE ACCUM HL = 2*DE
FED9 29 00860 ADD HL,HL ;AGAIN HL = 4*DE
FEDA 19 00870 ADD HL,DE ;ADD DE TO IT HL = 5*DE
FEDB 29 00880 ADD HL,HL ;DOUBLE IT HL=10*DE
FEDC E67F 00890 AND 7FH ;STRIP OUT BIT 7 OF BYTE
FEDE D630 00900 SUB 30H ;CONVERT IT TO BINARY
FEE0 5F 00910 LD E,A ;PUT IT IN DE FOR
FEE1 1600 00920 LD D,0 ;ADD IN NEXT STEP
FEE3 19 00930 ADD HL,DE ;ADD IT TO ACCUM
FEE4 CD3502 00940 CALL RDBYTE ;GET NEXT BYTE
FEE7 10ED 00950 DJNZ LINENO ;DO AGAIN UNTIL DONE
FEE9 FE09 00960 CP NUMTRM ;IS LAST BYTE NUMTRM?
FEEB 2020 00970 JR NZ,ERROR ;IF NOT, ERROR
FEEF 7D 00980 LD A,L ;ELSE, GET LSB OF LINE
FEEE DDBE00 00990 CP (IX) ;IS IT IN EDTBUF?
FEP1 201A 01000 JR NZ,ERROR ;IF NOT, ERROR
FEP3 DD23 01010 INC IX ;ELSE, BUMP EDTBUF PNTR
FEP5 7C 01020 LD A,H ;AND GET MSB OF LINE
FEP6 DDBE00 01030 CP (IX) ;IS IT IN EDTBUF?
FEP9 2012 01040 JR NZ,ERROR ;IF NOT, ERROR
FEPB DD23 01050 INC IX ;ELSE, BUMP EDTBUF PNTR
FEPD DD23 01060 INC IX ;AND AGAIN PAST LNTH BYT
FEFF CD3502 01070 GETDAT CALL RDBYTE ;GET NEXT BYTE
FF02 FE0D 01080 CP 0DH ;IS IT C/R?
FF04 28C4 01090 JR Z,GETNXT ;IF SO, GET NEXT LINE NO.
FF06 DDBE00 01100 CP (IX) ;ELSE, IS IT IN EDTBUF?
FF09 DD23 01110 INC IX ;BUMP EDTBUF POINTER
FF0B 28F2 01120 JR Z,GETDAT ;IF IN EDTBUF, GET NEXT
FF0D CDF801 01130 ERROR CALL CASOFF ;ERROR-TURN OFF CASSETTE
FF10 2100FE 01140 LD HL,ERRMSG ;POINT TO ERROR MESSAGE
FF13 CDA728 01150 CALL VDLIN ;WRITE IT
FF16 188A 01160 JR ENTRY ;AND GO TRY AGAIN
FF18 CDF801 01170 TERM CALL CASOFF ;TERM-TURN OFF CASSETTE
FF1B 213FFE 01180 LD HL,TAPEOK ;POINT TO 'OKAY' MESSAGE
FF1E CDA728 01190 CALL VDLIN ;WRITE IT
FF21 C32A4C 01200 JP EDTRET ;AND RETURN TO EDTASM
FE96 01210 END TPECHK ;ENTRY FOR TPECHK PRGM

00000 Total Errors
```

End

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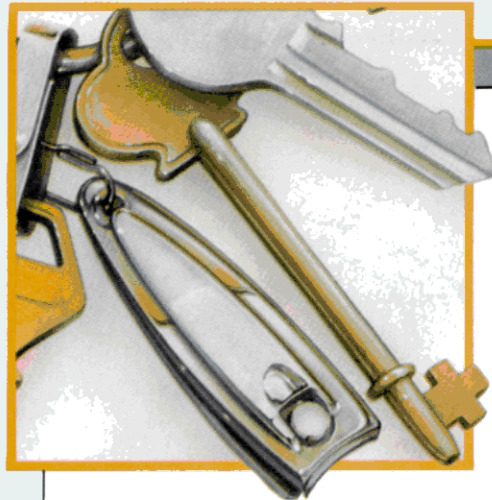


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Writing Model I/III input screens is as easy as answering a few simple prompts with Create.

The Screen Writer

by Doug Miller

Create is a Basic program that provides a fast way to develop Model I/III input screens. It's simple; all you do is enter the number of headings and input fields you want, name them, and wait for the Basic "Ready" prompt to appear. Type in LIST and you'll see your newly generated routine that you can save as a Basic file and merge with any Basic program.

In addition to generating the Basic code for the input screen, Create gives you the PRINT@ locations for all of the input fields. Figure 1 is an example of a routine Create generates. It produces the screen found in Fig. 2.

Using Create

Create asks you how many headings and how many input fields you want on the screen. It assumes that you want to include a screen heading and allows a maximum of five headings. If you indicate one heading, Create can provide up to 24 input fields.

Create limits input fields to 26, although a more practical figure is 20 fields per screen, allowing room for operator prompts. You're permitted up to 64 characters per field, with a field-name limit of 10 characters.

Once you enter the last field name, Create generates the required program lines for the input screen and deletes itself from memory. To merge your program lines, be sure to save them under the ASCII option. For example, you might save the program lines as follows: SAVE"SCREEN1/BAS",A.

Important Notes

Create starts numbering the generated routine at line 150, and never ex-

ceeds line 198. Therefore, when you write your main program, leave these lines open or renumber the routine. If you aren't merging your program, include a Clear statement in the routine to avoid an "Out of String Space" error.

The last line of the input screen routine is always a remark statement indicating the input fields' PRINT@ locations. In Fig. 1, the first input field starts at PRINT@ 459. Lines 156 and 168 generate solid bars at the beginning and end of the input area, giving your input screens an attractive appearance.

Lines 159 and 165 of Fig. 1 produce the field names and input fields. I've allowed a 20-character space for the input field. Note that lines 159 and 162 format the screen for two inputs per line. Create does this by dividing the number of input fields by 2. Because I requested five input fields in the example, Create divides 5 by 2 and comes up with a requirement of two lines with two input fields each. It then adds the remainder, 1 in this case, for a total of three lines for input fields.

Create now adds the number of headings requested (two here) plus two lines for the divider bars. Create calculates that the finished screen would require three lines for input, two lines for headings, and two lines for dividers, for a total of seven lines for the input screen.

The 16 PRINT@ locations on the left-hand side of the TRS-80 monitor run from zero to 960, increasing in increments of 64. Using this information, Create determines the number of lines on the finished screen and then selects a starting PRINT@ location that will result in a centered input screen.

Basic Concepts

After loading a Basic program into your computer, you can find the memory address for the start of the program by PEEKing addresses 40A4 and 40A5 hexadecimal (hex), or by using your DOS's Debug utility.

In a similar fashion, addresses 40F9 and 40FA hex contain the memory address of the simple variables the program uses. The variables table often starts directly after the last byte of the last line of your program. Therefore, you can assume that 40F9 and 40FA hex point to the end of the program, as well as to the beginning of the variables. Knowing this, you can force Basic to start the variables table wherever you want it to by adjusting the address found in these locations.

A line of Basic code follows certain conventions. For example, the first 2 bytes contain the memory address for the start of the next line of text, while the next 2 bytes contain the line number. Thus, we now know that the first 4 bytes stored in memory are always used for these same purposes. You also know that the last byte of each line in a Basic code is zero. You'll find the "action" code, which performs operations such as print, multiply, If... Then functions, etc., between a line's first 4 bytes and its terminating zero.

Table 1 illustrates this concept with a hypothetical program line. If you PEEK memory locations 40A4 and

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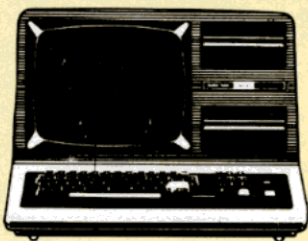
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40A5 hex, you'll find the address 6D00 (see the heading Memory Location in Table 1). The next heading, Basic Code, lists examples of Basic codes you might find. As mentioned above, the first 2 bytes (address 0A6D) point to the beginning of the next Basic program line at address 6D0A, which immediately follows the zero byte at memory location 6D09, signaling the end of the first line of Basic code.

Memory locations 6D02 and 6D03 contain 0A00, the first line number of our sample program which translates to line 10 in decimal. Then comes the action code, indicated by XX. Basic converts action words into 1-byte codes called tokens. Table 2 lists Create's action words.

Line 25 of the Program Listing illustrates the use of tokens. The data statement in line 25 lists the following numbers:

196,40,54,48,44,247,40,49,51,49,41,41

This translates into STRING\$(60, CHR\$(131)), the code that generates the divider bar on the video screen.

If you refer to the token codes in Table 2 and an ASCII code table, you can make the complete translation yourself. By adding the correct 4 bytes (the pointer and the line number) to the beginning of this code and a zero byte at the end, you'll have a line of Basic code. That's how Create works—it takes your inputs, adds the right pointers, line numbers, and tokens, and generates the lines of a Basic code.

Housekeeping Functions

Lines 1-28 are housekeeping lines that set up key variables and define functions. The GOSUB 112 moves the start of the variables list table to higher memory, giving Create the room necessary to add the lines of Basic code it generates to the end of itself. The GOSUB 124 calculates this end location.

Line 14 initializes a machine-language subroutine. The routine, called in line 103, moves blocks of code around. You could use a series of PEEKs and POKEs, but that would be much slower.

Line 16 defines a function that handles PEEK and POKE address calculations above 32767. Line 19 defines a

function that centers a string used to center the headings. Line 28 stores, in an array, all the possible PRINT@ ad-

dresses Create uses, and POKEs the divider line code (STRING\$(64,CHR\$(131))) into memory.

```

150 PRINT@256,"
153 PRINT@320,"
156 PRINT@384,STRING$(60,CHR$(131))
159 PRINT@448,"NAME      :      AGE      :
162 PRINT@512,"SEX       :      STREET   :
165 PRINT@576,"CITY      :
168 PRINT@640,STRING$(60,CHR$(131))
171 REMEMBER YOUR PRINT@ POSITIONS ARE:-- 459 492 523 556 587

```

Figure 1. Sample of Create/Bas generated code.

```

CITY GENERAL HOSPITAL
PATIENT RECORD
-----
NAME      :      AGE      :
SEX       :      STREET   :
CITY      :
-----

```

Figure 2. Sample video screen.

Memory Location	Basic Code	Comments
6D00	0A	First 2 bytes point
6D01	6D	to start of next line
6D02	0A	2-byte line number
6D03	00	
6D04-6D08	XX	Action codes
6D09	00	End of first line
6D0A	16	Next 2-byte pointer
6D0B	6D	Etc...
6D0C	14	
6D0D	00	

Table 1. Memory locations and codes.

Token		Basic Key Word
Decimal	Hex	
178	B2	PRINT
147	93	REM
196	C4	STRING\$
247	F7	CHR\$

Table 2. Tokens used by Create.

```

Element 1 @256," CITY GENERAL HOSPITAL"
Element 2 @320," PATIENT RECORD"
Element 3 @384,STRING$(64,CHR$(131))
Element 4 @448,"NAME : AGE : "
Element 5 Etc...

```

Table 3. A2\$ array.

Program Listing. Input screen generator.

```

1 *****
  CREATE....INPUT SCREEN GENERATOR
  DOUG MILLER
  *****

```

Listing continued on p. 104

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Headings and Fields

Lines 31-43 accept data for the number of headings and input fields you specify. Line 40 calculates the total number of lines (TL) your screen needs. It also sets up counters (LC and EN) to keep track of the current screen line. Line 40 is also responsible for A2\$(EN), which contains part of the "Remember" line. Line 43 creates the A1\$ array that contains the required PRINT@ locations.

Lines 46-85 accept the headings and field names, building them into strings. Eventually, these strings will become part of the program lines Create generates. For example, look at lines 49-55; the program asks for a heading and then centers it. Line 55 builds a string consisting of the correct PRINT@ position (A1\$(LC)), an open-quote mark (CHR\$(34)), the heading (HC\$), and a close quote (CHR\$(34)).

Create goes through a similar process for the field names. The GOSUBS in lines 58 and 85 set up the divider bar code and transfer it to a string. Create,

by this time, has created the A2\$ array shown in Table 3.

Completing the Process

Lines 88-103 complete the program lines, moving them into place at the end of Create. In line 88 you set the current address, CA = EP%, which points to the end of Create.

Line 94 calculates the address for the start of the next program line. The next address (NA) is the current address (CA) plus six plus the length of the string that makes up the program line. The six allows for the mandatory first 4 bytes, as well as 1 byte each for the print token and the zero at the end of a line.

Line 97 breaks NA into its most significant byte (MS%) and its least significant byte (LS%). Create then POKES LS% and MS% into CA and CA + 1. Then it POKES CA + 2 and CA + 3 with the line number (LN). Create then POKES CA + 4 with the token for print (178) or, if it's the last line used, with REM (147).

Line 103, the block move routine, transfers the contents of an element

from the string array into position, starting at CA + 5. In the example in Fig. 1, this is done first by moving @256, CITY GENERAL HOSPITAL, into place. Create then puts a zero byte at the end of the line. This process is repeated until all lines are in place. After the last line, Create inserts two additional zeros, indicating the end of the program. Finally, Create deletes itself, leaving only the program lines generated.

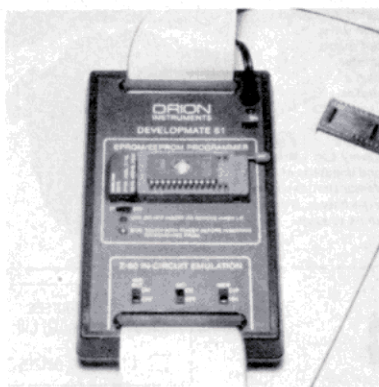
Line 109 is a string pointer routine that lets you move strings into any memory location. Line 112, a variant of the string pointer routine, resets Basic's pointer to the start of the variables storage area. Line 124, the last line of the program, calculates the memory location of the end of the program. ■

Contact Doug Miller at 214 Centennial Road, West Hill, Ontario, M1C 1Z9.

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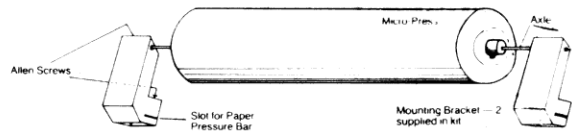
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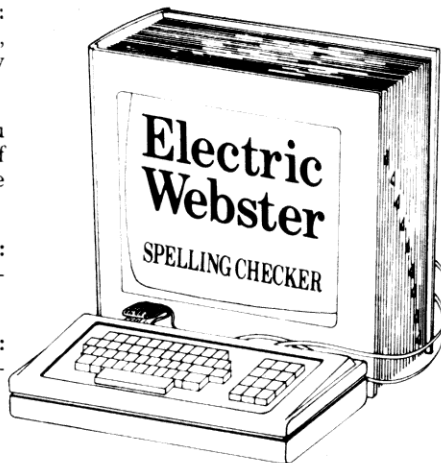
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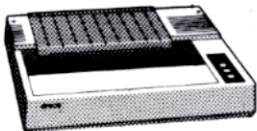
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Listing continued from p. 100

```

2 'REMEMBER SET MEMORY AT 62000
10 CLS:POKE&H40B1,30:POKE&H40B2,242:CLEAR5000:GOSUB112:GOSUB124
13 DIMA$(18),A2$(18),POS$(18):TC%=178:DEFINTU,X:J%=0:SG$=STRING$(
(64,131)
14 US(0)=8448:US(2)=4352:US(4)=256:US(6)=-20243:US(7)=201
16 DEFFNSI%(A1!)=-((A1!>32767)*(A1!-65536))-((A1!<32768)*A1!)
19 DEFFNCN$(A$,A%)=STRING$(A%/2-LEN(A$)/2-.5,"")A$
22 DATA"@000","@064","@128","@192","@256","@320","@384","@
@448","@512","@576","@640","@704","@768","@832","@896","@
@960,"
25 DATA196,40,54,48,44,247,40,49,51,49,41,41
28 FORX=1 TO16:READA$:POS$(X)=A$:NEXT:FORX=1 TO12:READA$:POKEFNSI%(
(65520+X),A:NEXT
31 PRINT@384,SG$:PRINT@704,SG$:
34 PRINT@512,"INPUT NUMBER OF HEADINGS ";:INPUTH:IFH>5THEN34
37 PRINT@576,"INPUT NUMBER OF FIELDS ";:INPUTF:IFF>24THENPRINT@5
76,STRING$(50,32):GOTO37
38 IF F=0 AND H=0 THENPRINT@448,STRING$(2,13):GOTO34
40 F1=INT(F/2):F2=F-(F1*2):F3=F1+F2:TL=F3+2+H:TM=INT((16-TL)/2):
LC=TM+1:EN=LC+TL:A2$(EN)="EMBER YOUR PRINT@ POSITIONS ARE:--"
41 IF TL>15THENPRINT@832,"NUMBER OF HEADINGS PLUS INPUT FIELDS...
EXCEED LIMITS....REDO PLEASE":FORX=1 TO 2500:NEXT:CLS:GOTO31
43 FORX=1 TO TL:A1$(LC)=POS$(LC):LC=LC+1:NEXT
46 LC=TM+1:K=LC:IFH=0THEN58
47 PRINT@384,SG$:PRINT@704,SG$:
49 FORX=K TO K+H-1
52 PRINT@448,STRING$(2,13):PRINT@512,"INPUT HEADINGS ";:INPUTH$
53 IF LEN(H$)>64THENPRINT@896,"HEADING EXCEEDS 64 CHARACTERS":FOR
M=1 TO 1500:NEXT:PRINT@896,CHR$(31):GOTO52
54 HC$=FNCN$(H$,64)
55 A2$(LC)=A1$(LC)+CHR$(34)+HC$+CHR$(34):LC=LC+1:NEXT
58 GOSUB106:LC=LC+1:K=LC
61 FORX=K TO K+F1-1
62 PO%=1:IFF3=0THEN88
63 IF F=1 THEN 79
64 FORY=1 TO 2
67 PRINT@448,STRING$(2,13):PRINT@512,"INPUT FIELD NAMES ";:INPU
TF$(Y)
68 IF LEN(F$(Y))>10THENPRINT@832,"FIELD NAME EXCEEDS 10 CHARACTE
RS....PLEASE RE-ENTER":FORM=1 TO1500:NEXT:PRINT@832,CHR$(31):GO
TO67
70 A2$(LC)=A1$(LC)+CHR$(34)+F$(1)+STRING$(10-LEN(F$(1)),"")+":
+STRING$(22,"")+F$(Y)+STRING$(10-LEN(F$(Y)),"")+":+CHR$(34)
71 PA%=((LC-1)*64)+PO%
72 A2$(EN)=A2$(EN)+STR$(PA%):PO%=44
73 NEXTY:LC=LC+1:NEXTX
76 IF F2=0 THEN 85
79 PRINT@448,STRING$(2,13):PRINT@512,"INPUT FIELD NAME ";:INPUT
F$(1)
80 IF LEN(F$(1))>10THENPRINT@832,"FIELD NAME EXCEEDS 10 CHARACTE
RS....PLEASE RE-ENTER":FORM=1 TO1500:NEXT:PRINT@832,CHR$(31):G
OTO79
82 A2$(LC)=A1$(LC)+CHR$(34)+F$(1)+STRING$(10-LEN(F$(1)),"")+":
+CHR$(34):LC=LC+1
83 PA%=((LC-2)*64)+11
84 A2$(EN)=A2$(EN)+STR$(PA%)
85 GOSUB 106
86 PRINT@512,"YOUR INPUT SCREEN NOW BEING WRITTEN"
88 LC=TM+1:CA=EP%:LN=150
91 FORX=LC TO EN
94 NA=CA+6+LEN(A2$(X))
97 MS%=INT(NA/256):LS%=NA-(MS%*256)
99 IFX=EN THENTC%=147
100 POKEFNSI%(CA),LS%:POKEFNSI%(CA+1),MS%:POKEFNSI%(CA+2),LN:POK
EFNSI%(CA+3),0:POKEFNSI%(CA+4),TC%:LN=LN+3:CA=CA+5
103 DA=PEEK(VARPTR(A2$(X))+1)+(PEEK(VARPTR(A2$(X))+2)*256):US(1)
=FNSI%(DA):US(3)=FNSI%(CA):US(5)=LEN(A2$(X)):DEFUSR=VARPTR(US(0)
):J%=USR(0):POKEFNSI%(NA-1),0:CA=NA:NEXT:POKEFNSI%(NA),0:POKEFNS
I%(NA+1),0:DELETE1-124
106 A1%=12:A%=FNSI%(65521):GOSUB109:A$=A$:A2$(LC)=A1$(LC)+A$:RE
TURN
109 A$="":POKEVARPTR(A$),A1%:POKEVARPTR(A$)+1,ASC(MKI$(A%)):
POKEVARPTR(A$)+2,ASC(RIGHT$(MKI$(A%),1)):RETURN
112 A$="":FORA%=1TO3:A$=A$+MKI$(&HA500):NEXT:A$="XXXXXX":POKEVA
RPTR(A$)+1,&HF9:POKEVARPTR(A$)+2,&H40:LSETA$=A$:A$="":RETURN
124 A$="":EP%=VARPTR(A$):EP%=CVI(CHR$(PEEK(EP%+1))+CHR$(PEEK(EP%
+2)))+48:RETURN

```

End

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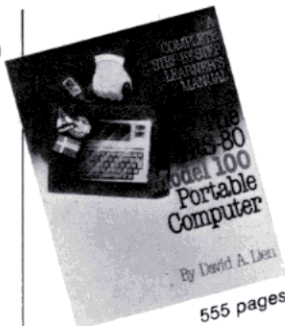
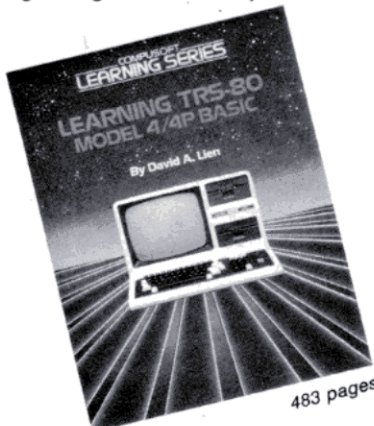
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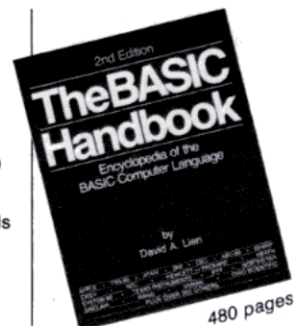
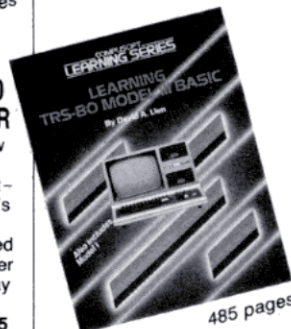


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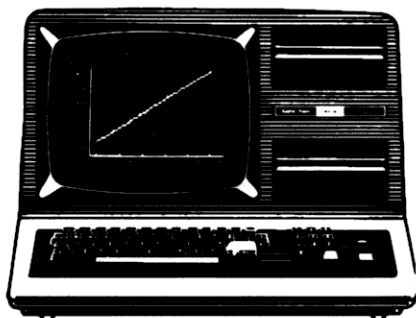
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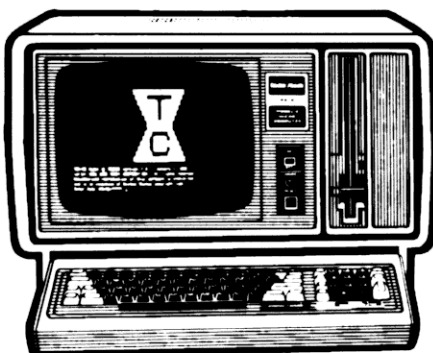
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You'll never have to write another user-input routine for your Basic programs. Formatter lets you define an input prompt and call it with a single line of Basic.

Easy Input

by Roger A. Smith Jr.

W

riting user-input routines can be frustrating. You need to define what type of input is acceptable (numeric or alphanumeric characters, upper- or lowercase, and so on) as well as the number of characters allowed. Not only is this a complicated chore, it also makes for lengthy programs.

I've written a statement that lets you easily define the format for user input in your Model III Basic programs. It shortens your programming time and your programs; the input statement fits in just one line of code.

My input statement works with NEWDOS80 and TRSDOS. To use it, you have to type in Program Listing 1 (Formatter) and assemble it under a file name like `FORMAT/CMD`.

Before you can program with the input statement, you must set the memory size or `HIMEM` at eight less than the program's starting address (at the label `Setup`). If you want to assemble the program at the top of memory, use the origins and memory sizes in Table 1. You must set the memory size at either DOS Ready or after you enter Basic, depending on which DOS you use.

If you don't have a disk system, you'll need to load the machine-language program by typing in `SYSTEM` and execute it by pressing the slash key (`/`) followed by the enter key. Disk Basic users should assemble the program into a `/CMD` file and execute it from Basic by entering `CMD"FORMAT/CMD"` in NEWDOS80. In Model III TRSDOS, use the following line (change the `FD7B` to the origin you use when assembling the program):

```
CMD"L","FORMAT/CMD":DEFUSR0=
&HFD7B:X=USR(0)
```

Formatter stays patched into Basic (even if you type `NEW` or load another program) until you exit Basic or turn off the computer.

Program Listing 2 is a demonstration of how you can incorporate Formatter into a Basic program. Try it to see the options that Formatter provides. The Figure shows a sample screen dump from Listing 2.

Using the Input Statement

Once you've taken care of the memory size and are in Basic, you can use the input statement in any program. Type it in using the following syntax:

```
INPUT@ printat, flag, USING string ; variable
```

The `printat` value works the same as in a `PRINT@` statement; it simply moves the cursor to the selected screen position.

By changing the flag value, you can limit the format of any input to such options as only numerals or uppercase letters, select the speed at which the cursor blinks, select whether or not you want the background displayed, and so on, as shown in Table 2. Only the bits in the low-order byte of the flag value control the seven parameters.

The string defines the input's format. The string must contain at least one pound symbol (`#`), since pound symbols indicate the spots you want to leave for user input. You can use other symbols in the string, but they appear as themselves on the screen and aren't replaced by input. The pound symbols appear in the input line as either the background character or spaces, depending on how you set bit 2; user input then replaces these characters.

After you enter data, the output variable's length is equal to the number of pound symbols in the format

string. The string is padded with spaces on the right if necessary.

The input statement accepts Basic commands such as those listed in Table 3. If you omit the flag value (as in the last example in Table 3), the statement defaults to the last flag value used.

Formatter generates an error if you press the up- or down-arrow key when bit 1 of the flag value is zero. This lets you use the up- and down-arrow keys as control keys (see line 190 of Listing 2 where I use `START` and `END` to demonstrate this). For example, you can press the down-arrow key when you've finished entering data, and the program can trap the input error and take the appropriate action. The up-arrow key generates error code 100 (`ERR/2+1=100`) and the down-arrow key generates error code 101.

If you set bit zero of the flag value equal to 1, the user can enter only the numerals zero to 9. By setting bit 1, you disable the error statement for the up- and down-arrow keys. Set bit 2 to make the background appear as spaces. If you set bit 3, the program ignores your pressing the enter key unless you haven't entered any characters or if you've already entered the maximum number of characters. If you set bit 4 as a 1, the cursor won't flash. Setting bit 5 as a 1 means you can't enter low-

The Key Box



Model III
16K RAM Cassette Basic
32K RAM Disk Basic
Assembly Language
Editor/Assembler
NEWDOS80
TRSDOS

This is a demonstration of the formatted input routine.
 When 'FORMAT?' appears, type in the format string. Try using 'PHONE (###) ###-####'.
 When 'FLAG?' appears, type in the flag value. Try '9' (numerals only, maximum or no characters only).
 When 'PRINT AT?' appears, type in the print at location. Try '860'.
 After you enter the print at location, the input statement is executed. Experiment with the backspace, up and down arrows, and the <ENTER> key.

```
FORMAT? PHONE (###) ###-####
FLAG? 9
PRINT AT? 860                PHONE (...) ...-....
```

Figure. Sample screen dump from Program Listing 2, the demonstration program. The line at the bottom right is for user input.

Origin		Memory Size
16K	7D7B hex	32115 7D73 hex
32K	0BD7B hex	48499 BD73 hex
48K	0FD7B hex	64883 FD73 hex

Table 1. Origins and memory sizes for different amounts of RAM. Refer to this chart if you want to assemble Formatter at the top of memory.

Bit	Function	Weight
0	numerals only	1
1	no return on up or down arrow	2
2	no background displayed	4
3	maximum or no characters only	8
4	no cursor flashing	16
5	caps lock	32
6	cursor blink speed	64
7	(see Table 4)	128

Table 2. Individual bits within the flag byte control various functions of the formatted input statement. Add the weights together to select the functions you wish. For example, to allow numbers only with no background displayed and a nonflashing cursor, use a flag value of 21 (1 + 4 + 16).

```
INPUT@256,FL,USING"###";A$
INPUT@PA/2+1,128+32+2+1,USING B$+A$;C$
INPUT@1000*SIN(X),USING "##/##/##";D$
```

Table 3. Sample Basic commands that the input statement accepts.

Bit 6	Bit 7	Cursor Speed	Weight
0	0	Slowest	0
1	1	Slow	192
1	0	Fast	128
0	1	Fastest	64

Table 4. Bits 6 and 7 of the flag select the rate at which the cursor blinks.

er case letters. Bits 6 and 7 control the speed at which the cursor flashes as shown in Table 4. To set more than 1 bit, add up their values from the weight column in Table 2 and use that number in the input statement.

In addition to the new input statement, Formatter adds a new function to Basic. The &POS function returns the current cursor position as an integer from zero to 1023. Use this when you want the INPUT@ to occur at the current cursor position; type: INPUT@ &POS, flag, string; variable.

How Formatter Works

Patching Formatter into Basic requires several vectors (a vector is a branch or jump to another location). ROM takes one vector when it encounters the ampersand (&), such as in the &POS function. When the ROM comes across the ampersand, it jumps to 4194 hex. At 4194 hex, the program checks to make sure that POS follows the ampersand and then jumps to the new &POS routine. If POS doesn't follow the ampersand, the program uses the original vector jump. If POS does follow the ampersand, then the program puts a 2 in 40AF hex, where the ROM determines with what type of data it's working. If 40AF hex contains a 2, then the data is in integer format; a 3 means you're dealing with strings; 4 represents single-precision numbers and 8 double-precision numbers. I use a 2.

Hex address 4020 stores the cursor position, but, since video RAM starts at 3C00 hex, you must subtract 3C00 hex from the cursor position's value. The result is placed in 4121 hex, where the ROM expects to find an integer.

The ROM's Input routine jumps to 41D6 hex when it arrives at the first nonspace character after the input token. The accumulator will contain the character. Therefore, the first instruction in the Input patch checks the A register for an @ sign; if there isn't one, the program takes the old vector exit. If the accumulator does contain an @ symbol, the program calls the ROM routine at 2B01 hex. This routine determines the value of the expression starting at HL + 1, puts this value into the DE register, and then exits, putting the most significant byte in A.

If the value is less than zero or greater than 1,023, the A register con-

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tains a value greater than 3. The program compares A to 4. If the comparison doesn't generate a carry, the program jumps to 1E4A hex, generating a function call error.

The program adds DE's value to

3C00 hex to generate the PRINT@ position, which it places in 4020 hex.

An RST 8 checks for the comma following the PRINT@ value. If the next byte contains the Using token, the program jumps to the Using routine.

The program evaluates the flag value in about the same way as it does the PRINT@ location, except it stores only the E register (least significant byte).

If the Using token doesn't follow the comma, the program jumps to 1997 hex, generating a syntax error.

The routine at 2337 hex evaluates the format string and any expression to which HL points. After the call to 2337 hex, 40AF hex contains the type of result. If it is an integer (type = 2), then 4121 hex contains the result. If it is a single-precision number (type = 4), the program stores it in the 4 bytes starting at 4121 hex. If the result is double-precision (type = 8), the program stores it in 8 bytes starting at 411D hex.

If the result is a string (which you want here), then 40AF hex should contain a 3, and 4121 hex will point to the string descriptor. But before determining that, the program looks for the semicolon that precedes the output variable. If it doesn't find one, it generates a syntax error.

Next, Formatter tests the type flag. If the flag's value is something other than 3, the program jumps to 0AF6 hex, generating a type mismatch error. If it is a 3, the program loads the DE register with the string descriptor's address (from 4121 hex). The first byte is the length of the string. If the length is zero, Formatter generates a function call error.

Register B and the location labeled TEMP store the length. Formatter loads HL with the next 2 bytes of the string descriptor, leaving HL pointing to the actual string. It stores the start of the string in STRING. C and LEN count and store the number of pound symbols in a string. An absence of pound symbols generates a function call error.

Formatter loads register B with the background character based on bit 4 of the flag. If you want to change the background, change the value in line 200 of the Assembly-language text (the background must be under 32 [20 hex] or greater than 127 [7F hex]).

The program loads DE with the cursor location and HL with the address of the string. The string appears on the screen with the pound symbols replaced by the background character.

The main input loop starts at Loop2 where the program determines if

Program Listing 1. Formatter.

```

00100 ;*****
00110 ;**          FORMATTED INPUT ROUTINE          **
00120 ;**          By Roger Smith                    **
00130 ;**
00140 ;**          Copyright 1983--MTS, Inc.          **
00150 ;**          Used by permission of MTS, Inc.    **
00160 ;*****
00170
00180          ORG      0FD7BH          ;CHANGE IF NEEDED
00190 CURCHR EQU      143            ;CURSOR CHARACTER (CHANGE IF D
ESIRED)
00200 BCKCHR EQU      238            ;BACKGROUND CHARACTER (CHANGE
IF DESIRED)
00210 KEYSUB EQU      2BH            ;ROM KEYBOARD SUBROUTINE
00220 TEST EQU       0AF4H          ;GENERATES TM ERROR IF REG1 IS
NOT A STRING
00230 TMERR EQU       0AF6H          ;GENERATES TM ERROR
00240 SNERR EQU       1997H          ;GENERATES SN ERROR
00250 ERROR EQU       19A2H          ;ROM ERROR ROUTINE
00260 FCERR EQU       1E4AH          ;GENERATES FC ERROR
00270 VARPTR EQU       26D0H          ;RETURNS VARPTR
00280 GETINT EQU       2B01H          ;EVALUATES INTEGER EXPRESSION
00290 EVAL EQU        2337H          ;EVALUATES EXPRESSION
00300 CAPS EQU        4019H          ;CAPS LOCK
00310 CURPOS EQU       4020H          ;CURSOR POSITION
00320 INKEY EQU        4099H          ;LAST KEY PRESSED
00330 TABPOS EQU       40A6H          ;CURSOR TAB POSITION (0-63)
00340 KEYBUF EQU       40A7H          ;POINTER TO KEYBOARD BUFFER
00350 TYPE EQU        40AFH          ;VARIABLE TYPE FLAG
00360 POOL EQU        40B3H          ;NEXT AVAILABLE LOCATION IN ST
RING LITERAL POOL
00370 POOLAD EQU       40B5H          ;STRING LITERAL POOL
00380 REG1 EQU        4121H          ;REG1 (INTEGER AND STRING)
00390 VAND EQU        4194H          ;% VECTOR
00400 VINPUT EQU       41D6H          ;INPUT VECTOR
00410 SETUP LD        HL,(VINPUT+1) ;GET INPUT VECTOR
00420 LD          DE,ENTRY           ;GET ENTRY
00430 RST         18H               ;COMPARE HL AND DE
00440 JR          NZ,SETUP2          ;IF NOT ALREADY PATCHED THEN S
ETUP2
00450 LD          HL,(ADDR1)         ;ELSE GET ADDRESSES
00460 LD          DE,(ADDR2)
00470 LD          BC,(CODES)
00480 JR          SETUP3
00490 SETUP2 LD        DE,(VAND+1)   ;'% VECTOR
00500 LD          A,(VAND)
00510 LD          B,A
00520 LD          A,(VINPUT)
00530 LD          C,A
00540 SETUP3 LD        (OUT+1),DE    ;STORE ADDRESSES
00550 LD        (OUT1+1),HL
00560 LD        (ADDR1),HL
00570 LD        (ADDR2),DE
00580 LD        (CODES),BC
00590 LD        A,B
00600 LD        (OUT),A
00610 LD        A,C
00620 LD        (OUT1),A
00630 LD        HL,ENTRY           ;PATCH INTO
00640 LD        (VINPUT+1),HL       ; VECTORS
00650 LD        HL,POS
00660 LD        (VAND+1),HL
00670 LD        A,0C3H             ;0C3H = JP
00680 LD        (VAND),A
00690 LD        (VINPUT),A
00700 RET
00710 POS INC          HL           ;CHECK NEXT
00720 LD          A,(HL)            ; CHARACTER
00730 DEC          HL              ;RESTORE POINTER
00740 CP          0DCH              ; IS IT 'POS'?
00750 JR          Z,POS1            ; IF SO THEN POS1
00760 OUT         JP          0      ;IF NOT THEN RET
00770 POS1 PUSH        HL           ;STORE LINE LOC
00780 LD          A,2               ;STORE INTEGER
00790 LD        (TYPE),A           ; IN TYPE LOCATION
00800 LD          HL,(CURPOS)        ;GET CURSOR POSITION
00810 LD          BC,-3C00H          ;SUBTRACT 15360
00820 ADD          HL,BC
00830 LD          (REG1),HL          ;STORE IN REG1
00840 POP          HL              ;RESTORE POINTER
00850 INC          HL              ;BUMP PAST TOKEN
00860 RST         10H              ;SKIP SPACES
00870 RET
00880
00890 ENTRY CP          '0'         ;INPUT?
00900 JR          Z,PATCH            ;IF SO THEN CONT

```

Listing 1 continued

you've entered the required number of characters or whether it has reached a pound symbol in the format string; if either condition is met, the program branches to Match. If neither is true, it loops until it finds a pound symbol.

I designed the NORM subroutine to keep DE pointing at video RAM so the input statement doesn't run through reserved RAM. INCDE simply increments DE and then goes to NORM.

At Match, either the background or a space appears on screen, depending on whether or not you've entered all the characters. Then the program calls KEYIN to get a character from the keyboard.

If the character is a backspace, the program tests to see whether you've entered any characters; if you haven't, it ignores the backspace. If you have, you can backspace both the cursor and the format pointer (HL) until the pointer points to a pound symbol.

If the character is a down- or up-arrow, the program checks the flag to see if the error on either key is disabled. If it is, the program jumps to BADCHR which, in effect, ignores the character. Otherwise, the program loads the E register with the proper error code and exits to the ROM error routine at 19A2 hex.

If the character is a carriage return (13) and bit 3 of the flag value isn't set, the program jumps to the exit routine. If the bit is set, the program jumps to the exit routine only if you've entered all or none of the characters.

At this point, if you've entered all the characters, the program jumps to BADCHR. If you haven't entered all the characters, the program loops back to Loop3.

At Exit, the program erases the cursor and restores the pointers to the format and display. INKEY\$ (4099 hex) becomes zero. Formatter loads IY with the contents of 40A7 hex, making it point to the input buffer.

The program moves the characters you enter to the input buffer. The program replaces any remaining background characters with spaces.

The temporary string pointer at 40B3 hex is restored to 40B5 hex to prevent an ST error (string formula too complex). A zero marks the end of the text in the buffer.

The routine at 260D hex returns the

Listing 1 continued

```
00910 OUT1 JP 0 ;ELSE RETURN
00920 PATCH CALL GETINT ;EVAL INTEGER
00930 CP 4 ; > 1023?
00940 JP NC,FCERR ;IF SO THEN FC ERROR
00950 PUSH HL ;STORE POINTER
00960 LD HL,3C00H ;START OF VIDEO
00970 ADD HL,DE ;ADD OFFSET
00980 LD (CURPOS),HL ;CURSOR LOCATION
00990 POP HL ;RESTORE POINTER
01000 RST 8 ;COMPARE ROUTINE
01010 DEFB ' ' ; FIND COMMA
01020 LD A,(HL) ;GET NEXT CHARACTER
01030 CP 0BFH ;'USING'?
01040 JR Z,USING ;IF SO THEN JUMP
01050 DEC HL ;ELSE DECREMENT POINTER
01060 CALL GETINT ;EVALUATE INTEGER
01070 LD A,E ;GET LSB OF INTEGER
01080 LD (FLAG),A ;STORE IN FLAG
01090 RST 8 ;SEARCH FOR
01100 DEFB ' ' ; COMMA
01110 LD A,(HL) ;GET NEXT CHARACTER
01120 CP 0BFH ;'USING'?
01130 JP NZ,SNERR ;IF NOT THEN SN ERROR
01140 USING INC HL ;INCREMENT POINTER
01150 PUSH HL ;STORE POINTER
01160 CALL EVAL ;EVALUATE EXPRESSION
01170 POP HL ;RESTORE POINTER
01180 LOOPU INC HL ;INCREMENT POINTER
01190 LD A,(HL) ;GET CHARACTER
01200 OR A ;ZERO?
01210 JP Z,SNERR ;IF SO THEN SN ERROR
01220 CP ' ' ;SEMICOLON?
01230 JR NZ,LOOPU ;IF NOT THEN LOOP
01240 INC HL ;INCREMENT POINTER
01250 LOOPU2 LD A,(HL) ;GET CHARACTER
01260 OR A ;ZERO?
01270 JP Z,SNERR ;IF SO THEN SN ERROR
01280 CP 20H ;SPACE?
01290 JR NZ,EOL ;IF NOT THEN EOL
01300 INC HL ;ELSE INCREMENT POINTER
01310 JR LOOPU2 ;AND LOOP
01320 EOL LD (PTR),HL ;STORE POINTER
01330 LD A,(TYPE) ;GET VARIABLE TYPE
01340 CP 3 ;STRING?
01350 JP NZ,TMERR ;IF NOT THEN TM ERROR
01360 LD DE,(REG1) ;GET VARPTR
01370 LD A,(DE) ;A=LENGTH OF STRING
01380 OR A ;ZERO?
01390 JP Z,FCERR ;IF SO THEN FC ERROR
01400 LD B,A ;ELSE B=LENGTH
01410 LD (TEMP),A ;(TEMP)=LENGTH
01420 INC DE ;INCREMENT VARPTR
01430 LD A,(DE) ;GET LSB OF LOCATION
01440 LD L,A ;L=LSB
01450 INC DE ;POINT TO MSB OF LOCATION
01460 LD A,(DE) ;GET MSB
01470 LD H,A ;HL=>STRING
01480 LD (STRING),HL ;STORE HL
01490 LD C,0 ;COUNTER = 0
01500 LOOP LD A,(HL) ;COUNT THE NUMBER
01510 CP '#' ; OF #'S IN
01520 JR NZ,NEXT ; THE STRING
01530 INC C
01540 NEXT INC HL
01550 DJNZ LOOP
01560 LD A,C ;A=NUMBER
01570 LD (LEN),A ;STORE IN (LEN)
01580 OR A ;ZERO?
01590 JP Z,FCERR ;IF SO THEN FC ERROR
01600 LD A,(FLAG) ;GET FLAG
01610 LD B,BCKCHR ;LD B,BACKGROUND CHARACTER
01620 AND 4
01630 JR Z,BCKGRD ;TEST BIT 2
01640 LD B,32 ;IF NOT SET THEN BCKGRD
01650 BCKGRD LD DE,(CURPOS) ;ELSE BACKGROUND = BLANK
01660 LD HL,(STRING) ;GET CURSOR LOCATION
01670 PUSH HL ;GET POINTER TO STRING
01680 PUSH DE ;STORE STRING POINTER
01690 LOOP1 LD A,(HL) ;STORE CURSOR LOCATION
01700 CP '#' ;GET CHARACTER
01710 JR NZ,CONTZ ;'?'
01720 LD A,B ;IF NOT THEN SKIP
01730 CONTZ LD (DE),A ;ELSE A=BACKGROUND
01740 CALL INCDE ;DISPLAY IT
01750 INC HL ;INCREMENT CURSOR LOCATION
01760 LD A,(TEMP) ;POINT TO NEXT CHARACTER
01770 DEC A ;GET LENGTH OF STRING
01780 LD (TEMP),A ;DECREMENT IT
01790 JR NZ,LOOP1 ;AND STORE IT
01800 LD A,(LEN) ;CONTINUE UNTIL TEMP=0
01810 LD C,A ;GET NUMBER OF #'S
01820 CONT1 LD (CURPOS),DE ;STORE IN C
01830 LD A,E ;STORE CURSOR LOCATION
01840 AND 3FH ;COMPUTE
01850 LD (TABPOS),A ;TABPOS
01860 POP DE ; AND STORE IT
;GET STARTING CURSOR LOCATION
```

Listing 1 continued

Continued on p. 116

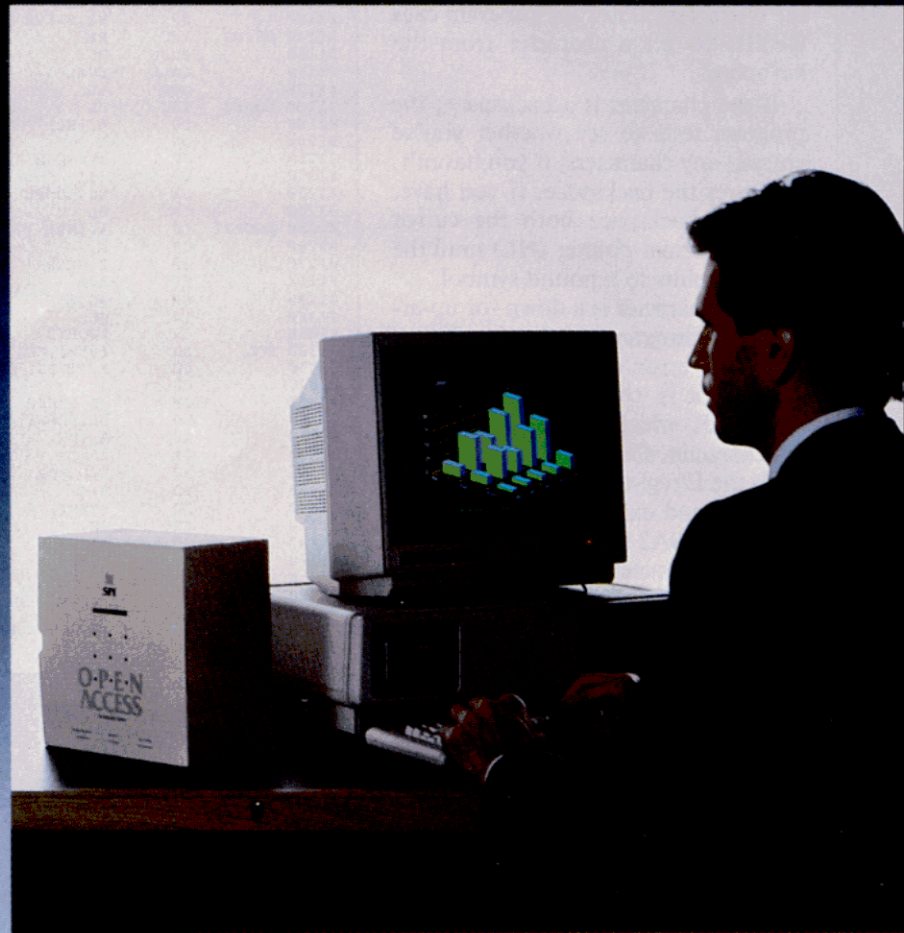
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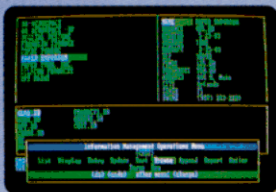
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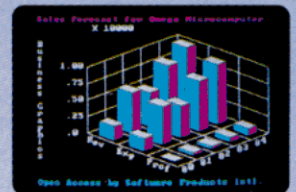
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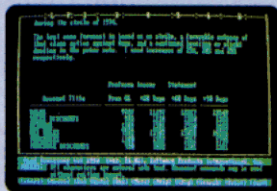


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4



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```

01870 POP HL ;GET STARTING STRING LOCATION
01880 LD (SCREEN),DE ;STORE CURSOR LOCATION IN (SCR
EEN)
01890 LOOP2 LD A,C ;A = NUMBER OF INPUT CHARACTER
S LEFT
01900 OR A ;ZERO?
01910 JR Z,MATCH ;IF SO THEN MATCH
01920 LD A,(HL) ;ELSE GET CHARACTER
01930 CP '#' ;'#'?
01940 JR Z,MATCH ;IF SO THEN MATCH
01950 LOOP3 INC HL ;NEXT CHARACTER
01960 CALL INCDE ;INCREMENT CURSOR LOCATION
01970 JR LOOP2 ;LOOP
01980 INCDE INC DE ;INCREMENT CURSOR LOCATION SUB
ROUTINE
01990 NORM LD A,D ;KEEP DE ON SCREEN
02000 AND 3FH
02010 OR 3CH
02020 LD D,A
02030 RET
02040 MATCH LD A,C ;GET INPUT CHARACTERS LEFT
02050 OR A ;ZERO?
02060 JR NZ,MATCH2 ;IF NOT THEN MATCH2
02070 LD A,32 ;ELSE A=SPACE
02080 JR MATCH4 ;GOTO MATCH4
02090 MATCH2 LD A,B ;GET BACKGROUND
02100 MATCH4 LD (LOC),DE ;STORE LOCATION
02110 LD (DE),A ;DISPLAY CURSOR
02120 CALL KEYIN ;GET CHARACTER FROM KEYBOARD
02130 CP 8 ;BACKSPACE?
02140 JR NZ,NOTBK ;IF NOT THEN SKIP
02150 LD A,(LEN) ;GET LENGTH
02160 CP C ;CP TO CHARACTERS LEFT
02170 JR Z,MATCH ;IF SAME THEN MATCH
02180 INC C ;INCREMENT CHARACTERS LEFT
02190 LD A,1 ;A=1
02200 CP C ;C=1?
02210 JR Z,ONE ;IF SO THEN ONE
02220 LD A,B ;ELSE GET BACKGROUND
02230 LD (DE),A ;DISPLAY IT
02240 JR LOOPM ;LOOP
02250 ONE LD A,32 ;A=SPACE
02260 LD (DE),A ;DISPLAY IT
02270 LOOPM DEC DE ;BACKSPACE
02280 CALL NORM ;KEEP DE ON SCREEN
02290 DEC HL ;DECREMENT POINTER TO STRING
02300 LD A,(HL) ;GET CHARACTER
02310 CP '#' ;'#'?
02320 JR NZ,LOOPM ;IF NOT THEN LOOP
02330 JR MATCH ;ELSE MATCH
02340 NOTBK CP 10 ;DOWN ARROW?
02350 JR Z,TEN ;IF SO THEN TEN
02360 CP 91 ;UP ARROW
02370 JR NZ,NOT91 ;IF NOT THEN SKIP
02380 TEN EX AF,AF' ;STORE A IN A'
02390 LD A,(FLAG) ;GET FLAG
02400 AND 2 ;CHECK BIT 1
02410 JR NZ,BADCHR ;IF SET THEN BAD CHARACTER
02420 EX AF,AF' ;ELSE GET VALUE
02430 LD E,0C6H ;E=ERROR 100
02440 CP 91 ;UP?
02450 JP Z,ERROR ;IF SO THEN JUMP TO ERROR ROUTINE
02460 LD E,0CBH ;ELSE ERROR 101
02470 JP ERROR ;JUMP TO ERROR
02480 BADCHR LD A,B ;GET BACKGROUND
02490 LD (DE),A ;DISPLAY IT
02500 JR MATCH ;CONTINUE
02510 NOT91 CP 13 ;ENTER?
02520 JR NZ,NOT13 ;IF NOT THEN SKIP
02530 LD A,(FLAG) ;GET FLAG
02540 AND 8 ;CHECK BIT 3
02550 JR Z,EXIT ;IF NOT SET THEN EXIT
02560 LD A,(LEN) ;CHECK LENGTH
02570 CP C ;SHOULD BE ALL
02580 JR Z,EXIT ;(EXIT IF ALL)
02590 XOR A ;OR NONE
02600 OR C
02610 JR NZ,BADCHR ;IF NOT NONE THEN BAD CHARACTER
02620 JR EXIT ;ELSE EXIT
02630 NOT13 LD (TEMP),A ;STORE CHARACTER
02640 XOR A ;A=0
02650 OR C ;C=0?
02660 JR Z,BADCHR ;IF C=0 THEN BAD CHARACTER
02670 LD A,(TEMP) ;GET CHARACTER
02680 LD (DE),A ;DISPLAY IT
02690 DEC C ;DECREMENT COUNTER
02700 JP LOOP3 ;LOOP
02710 EXIT LD HL,(STRING) ;GET POINTER TO STRING
02720 LD A,32 ;A=SPACE
02730 LD (DE),A ;DISPLAY IT
02740 LD DE,(SCREEN) ;GET STARTING CURSOR POSITION
02750 LD A,(LEN) ;GET NUMBER OF INPUT CHARACTERS
02760 LD C,A ;STORE NUMBER IN C
02770 XOR A ;A=0
02780 LD (INKEY),A ;ERASE INKEYS
02790 LD IY,(KEYBUF) ;IY=>KEYBOARD BUFFER

```

Listing 1 continued

Continued from p. 113

variable pointer of the output variable in DE; the routine at 0AF4 hex tests to make sure the variable is a string. Then control returns to the Input routine in ROM.

The KEYIN subroutine handles the cursor flash. The routine first stores most of the registers on the stack. Then it loads HL with the current screen location and stores the character in that location. The routine moves the top 2 bits of the flag into register B to control the speed at which the cursor blinks. It then displays the cursor (you can change the cursor character in line 190).

Then Formatter calls the Scan subroutine. Scan stores bit 5 of the flag value in 4019 hex, the Model III's caps lock location. Next it calls the routine at 2B hex to check the keyboard for a character. If the routine doesn't find a character or if you've pressed the enter, backspace, up-arrow, or down-arrow keys, the program returns to KEYIN. If the character is less than a space, the program jumps to Bad, which returns to KEYIN after setting A to zero.

If you haven't set bit zero of the flag value, all characters are legal, so the subroutine returns to KEYIN. If the character is less than zero or greater than 9, the program jumps to Bad. If the character is a numeral, the subroutine returns to KEYIN.

KEYIN continues by determining if the character returned is a zero. If it isn't, KEYRET returns the character to the input routine. If bit 4 of the flag value is set, the program loops to NOFLSH, which keeps the cursor displayed. Otherwise, the program loads B with the cursor speed, displays the previous contents of the video location, and loops back to LoopK until B is decremented to zero or you press a key.

Now for the small print. The object and source code for the input routine are copyrighted by MTS Inc. as part of their Compuchurch line of software. You have the permission of MTS and myself to use this program for your own use. If you wish to distribute any or all of Formatter to others, you must obtain my permission. ■

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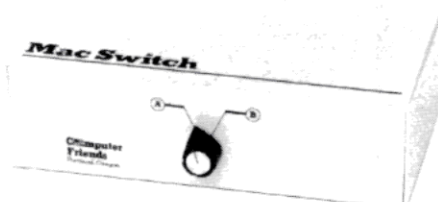
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Listing 1 continued

```

02800 LOOP4 LD A,(HL) ;GET CHARACTER
02810 CP '#' ;'#'?
02820 JR Z,MATCH1 ;IF SO THEN MATCH1
02830 LOOP5 INC HL ;NEXT CHARACTER
02840 CALL INCDE ;INCREMENT VIDEO POINTER
02850 JR LOOP4 ;AND CONTINUE
02860 MATCH1 LD A,(DE) ;GET INPUT CHARACTER
02870 CP B ;CP BACKGROUND
02880 JR NZ,CONT5 ;IF NOT THEN CONT5
02890 LD A,20H ;ELSE A=SPACE
02900 LD (DE),A ;DISPLAY SPACE
02910 CONT5 LD (IY),A ;STORE INPUT CHARACTER IN INPU
T BUFFER
02920 INC IY ;INCREMENT BUFFER POINTER
02930 DEC C ;DECREMENT COUNTER
02940 JR NZ,LOOP5 ;LOOP UNTIL DONE
02950 LD HL,POOLAD ;RESTORE TEMPORARY STRING
02960 LD (POOL),HL ; STORAGE POINTER
02970 LD (IY),0 ;MARK END OF INPUT
02980 LD HL,(PTR) ;GET POINTER TO POSITION IN PR
OGRAM
02990 POP AF ;CLEAR STACK
03000 CALL VARPTR ;FIND VARPTR
03010 CALL TEST ;IF NOT STRING THEN FC ERROR
03020 PUSH HL ;STORE POINTERS
03030 PUSH DE
03040 LD HL,(KEYBUF) ;GET BUFFER LOCATION
03050 DEC HL ;POINT TO BUFFER-1
03060 LD B,0 ;B=0
03070 CALL 2868H ;LET THE ROM HANDLE THE REST
03080 POP HL
03090 XOR A
03100 JP 1F33H
03110 TEMP DEFW 0
03120 LEN DEFB 0
03130 SCREEN DEFW 0
03140 KEYIN PUSH DE ;GET CHARACTER FROM KEYBOARD
03150 PUSH BC
03160 PUSH HL
03170 LOOPK LD HL,(LOC) ;GET VIDEO LOCATION
03180 LD A,(HL) ;GET CURRENT CHARACTER
03190 LD (TEMP),A ;STORE IT
03200 NOFLSH LD A,(FLAG) ;GET FLAG
03210 AND 0C0H ;GET BLINK RATE
03220 LD B,A ;STORE IN B
03230 LD (HL),CURCHR ;DISPLAY CURSOR CHARACTER
03240 LOOPK1 CALL SCAN ;CALL SCAN SUBROUTINE
03250 OR A ;ZERO?
03260 JR NZ,KEYRET ;IF NOT THEN KEYRET
03270 DJNZ LOOPK1 ;ELSE LOOP UNIT B=0
03280 LD A,(FLAG) ;GET FLAG
03290 BIT 4,A ;CHECK BIT 4
03300 JR NZ,NOFLSH ;IF SET THEN NO FLASH
03310 AND 0C0H ;ELSE GET BLINK RATE
03320 LD B,A ;B=DELAY
03330 LD A,(TEMP) ;GET CHARACTER
03340 LD (HL),A ;AND DISPLAY IT
03350 LOOPK2 CALL SCAN ;CALL SCAN SUBROUTINE
03360 OR A ;ZERO?
03370 JR NZ,KEYRET ;IF NOT THEN KEYRET
03380 DJNZ LOOPK2 ;LOOP UNTIL B=0
03390 JR LOOPK ;LOOP
03400 KEYRET POP HL ;CLEAR STACK
03410 POP BC
03420 POP DE
03430 RET
03440 SCAN LD A,(FLAG) ;AND RETURN
03450 AND 32 ;GET FLAG
03460 LD (CAPS),A ;BIT 5
03470 CALL KEYSUB ;LOAD CAPS FLAG WITH A
03480 OR A ;CALL ROM SCAN
03490 RET Z ;ZERO?
03500 CP 8 ;RET IF NO CHARACTER
03510 RET Z ;BACKSPACE?
03520 CP 13 ;RETURN IF SO
03530 RET Z ;ENTER?
03540 CP 91 ;RETURN IF SO
03550 RET Z ;UP ARROW?
03560 CP 10 ;RETURN IF SO
03570 RET Z ;DOWN ARROW?
03580 CP ' ' ;RETURN IF SO
03590 JR C,BAD ;SPACE?
03600 PUSH BC ;IF LESS THEN BAD
03610 LD B,A ;STORE BC
03620 LD A,(FLAG) ;CHARACTER IN B
03630 AND 1 ;GET FLAG
03640 LD A,B ;BIT 0
03650 POP BC ;A=CHARACTER
03660 RET Z ;RESTORE BC
03670 CP '0' ;RETURN IF BIT 0 NOT SET
03680 JR C,BAD ;ELSE TEST FOR NUMERAL
03690 CP '9'+1 ;IF LESS THAN '0' THEN BAD
03700 JR NC,BAD ;IF GREATER THAN
03710 RET ;'9' THEN BAD
03720 BAD XOR A ;ELSE RETURN
;A=0

```

Listing 1 continued

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Listing 1 continued

```

03730 RET
03740 FLAG 0
03750 DEFN 0
03760 LOC 0
03770 PTR 0
03780 ZZZ S-1
03790 ADDR1 EQU SETUP-2
03800 ADDR2 EQU SETUP-4
03810 CODES EQU SETUP-6
03820 HINEM EQU SETUP-6
03830 END SETUP

```

End

Program Listing 2. Demonstration program.

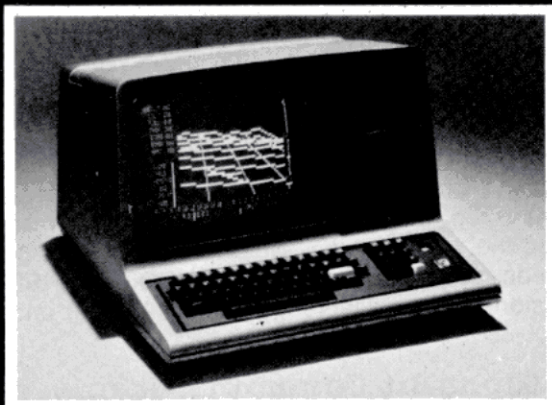
```

1 REM *****
2 REM ** Formatted Input Demonstration **
3 REM ** Remember to set the memory size and **
4 REM ** execute the machine language before **
5 REM ** running this program. **
6 REM *****
7 REM
10 CLEAR 1000 : CLS
20 ON ERROR GOTO 190
30 PRINT "This is a demonstration of the formatted input routine."
40 PRINT "When 'FORMAT?' appears, type in the format string."
50 PRINT "When 'PHONE (###) ###-####' appears, type in the flag value. Try '9'."
60 PRINT "When 'FLAG?' appears type in the flag value. Try '9'."
70 PRINT "(numerals only, maximum or no characters only)."
80 PRINT "When 'PRINT AT?' appears type in the print at location."
90 PRINT "Try '860'."
100 PRINT "After entering the print at location, the input statement is"
110 PRINT "executed. Experiment with the backspace, up and down arrows."
120 PRINT "and the <ENTER> key."
130 PA=860 : AS="###" : F=0
140 PRINT "04,? : INPUT "FORMAT";AS
150 INPUT FLAG;F
160 INPUT "PRINT AT";PA
162 :
165 :
170 INPUT "PA,F,USINGAS;BS"
175 :
177 :
180 T=0 : PRINT "BS=BS : GOTO 140"
190 E=ERR/2+1 : IF E=100 THEN PRINT "START" : RESUME 140 ELSE
IF E=101 THEN PRINT "END" : RESUME 140 ELSE ON ERROR GOTO 0

```

End

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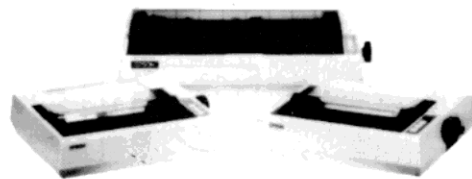
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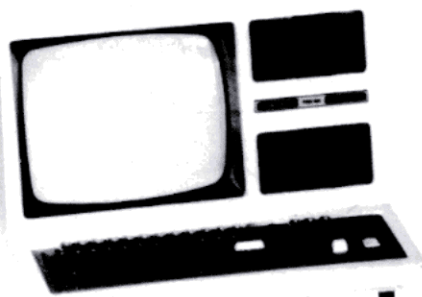
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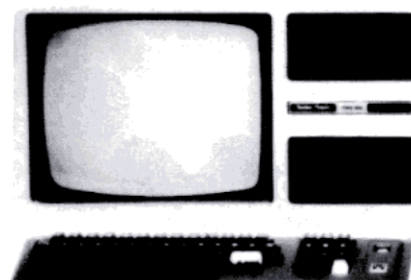


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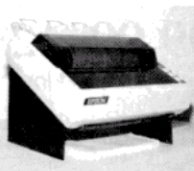
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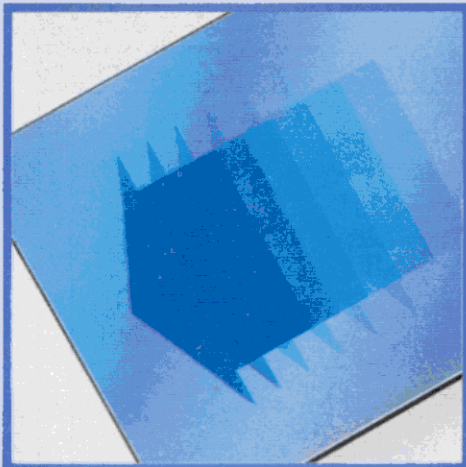
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Model III NEWDOS80 users can transfer source files from tape to disk with this LMOFFSET patch.

Tape Transfer

by J.L. Kissel

M

odel III NEW-
DOS80 2.0 us-
ers can't load
tape-based
source files be-

cause NEWDOS's EDTASM doesn't support Model III tape input/output (I/O). While the DOS's documentation describes how to load a source file from tape, zap 30 states that NEWDOS supports tape I/O for the Model I only.

I decided to rectify this. Rather than try to add Model III tape I/O capability to NEWDOS80 2.0's EDTASM, however, I modified the LMOFFSET program so it would load source files from tape to disk. You can do so by adding the LMOFFSET zaps indicated in the Figure. The Program Listing shows the source code of the patch.

To add the zaps yourself, copy LMOFFSET and save it under a new file name. (The zaps destroy LMOFFSET's ability to handle system tapes and support tape-to-disk loading only.) Then use SuperZap to make the changes listed in the Figure. ■

For instructions on how to assemble source code, consult your editor/assembler manual or "An Idiot's Guide to Assembly Language," Parts I and II (80 Micro, May 1981, p. 168, and June 1981, p. 112).

Contact J.L. Kissel at 287 London Road, Isleworth, Middlesex, England.

The Key Box



Model III
NEWDOS80 2.0

```
At 00,58 change:
3E FF CD 57 54 CD 3D 58
to:
3E 00 CD 7B 54 CD 7B 54

At 00,63 change:
FE 55 28 0A CD
to:
FE D3 28 0C CD

At 00,73 change:
CD 57 54
to:
CD 7B 54

At 00,78 change:
58 CD 35 02 FE 78 CA CA
54 FE 3C 28 05 CD 92 54
18 EC 3E 01 CD 7B 54 CD
35 02 47 C6 02 CD
to:
58 06 FF CD 35 02 CD 7B
54 FE 1A CA 32 54 10 F3
CD 35 02 CD 7B 54 FE 1A
CA 32 54 18 18

At 00,B7 change:
58 CD 35 02 FE 3C CA F8
53 FE 78 CA CA 54 F5 3E
49 32 3D 3C 3E FD CD 57
54 F1 C3
to:
58 ED 5B 9D 5E 13 ED 53

9D 53 C3 E7 53 3E 00 CD
7B 54 10 F9 CD 7B 54 C3
D5 54 C3

At 01,6F change:
C3 50 55 21
to:
C3 FC 56 21

At 03,A1 change:
F8 CD 20 44 C2 57 58 D9
21 9D 5E CD 33 57 30 FB
FE 01 28 0A FE 02 CA 44
57 CD 5C 57 18 0B CD 5C
57 05 05 CD 60 57 CD 60
57 CD 60 57 10 FB 18 DB
7E FE 20 D8 FE FE DA 48
58 23 5E 23 56 23 19 AF
C9 CD 5C 57 CD 5C 57 D9

78 B7
to:
F8 21 00 52 11 00 53 06
00 CD 20 44 D9 21 9F 5E
22 74 53 2A 9D 5E 23 23
22 9D 5E ED 5B 9D 5E 1B
ED 53 9D 5E 7A B3 CA 45
57 0E 00 06 01 2A 74 53
11 00 52 ED B0 22 74 53
D9 CD 3C 44 C2 9D 5E D9
18 D9 D9 CD 28 44 C3 59
57 B7
```

Figure. Zaps to LMOFFSET. Zap locations appear in sector and offset format (e.g., XX,YY means sector XX, offset YY).

Program Listing. Patch, the LMOFFSET modification program.

```
00100 ;
00110 ; LMOFFSET PATCHES
00120 ;
00130 ;TO ALLOW LMOFFSET TO READ A EDTASM TAPE AND
00140 ;WRITE IT TO A DISK FILE FOR USE BY APPARAT
00150 ;DISK BASED EDTASM
00160 ;
00170 ;DISK FORMAT MAY BE COMPATIBLE WITH OTHER EDTASM
00180 ;
53C6 00190 ORG 53C6H ;START OF PATCH
00200 ;CASSETTE IS ON AND SYNC HEADER HAS BEEN READ
53C6 3E00 00210 LD A,0H ;ZERO THE
```

Listing continued

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Listing continued

```

53C8 CD7B54 00220 CALL 547BH ;BLOCK COUNT
53CB CD7B54 00230 CALL 547BH ;I.E. NUMBER OF SECTORS TO WRITE
53D1 00240 ORG 53D1H
00245 ;
00250 ;FIRST BYTE OF TAPE IS NOW IN THE A REG
00251 ;
53D1 FED3 00260 CP 0D3H ;CHECK IF EDTASM
53D3 280C 00270 JR Z,53E1H ;TAPE AND JUMP IF IT IS
00271 ;
00272 ;WRITE FIRST BYTE TO BUFFER
00273 ;
53E1 00274 ORG 53E1H
53E1 CD7B54 00275 CALL 547BH ;FIRST BYTE TO BUFFER
00280 ;
00290 ;53E4 WILL CHECK FOR THE UP ARROW KEY ABORT FUNCTION
00300 ;
53E7 00310 ORG 53E7H
53E7 06FF 00330 RDBLK1 LD B,255 ;SET UP LOOP COUNT
53E9 CD3502 00340 RDBLK2 CALL 0235H ;READ A BYTE FROM TAPE
53EC CD7B54 00350 CALL 547BH ;WRITE BYTE TO BUFFER
53EF FE1A 00360 CP 1AH ;CHECK IF
53F1 CA3254 00370 JP Z,TAPFIN ;END OF FILE
53F4 10F3 00380 DJNZ RDBLK2 ;LOOP FOR 255 BYTES
53F6 CD3502 00390 CALL 0235H ;GET 256'S BYTE
00400 ;
53F9 CD7B54 00400 CALL 547BH ;AND SAVE IT
53FC FE1A 00410 CP 1AH ;CHECK IF
53FE CA3254 00420 JP Z,TAPFIN ;END OF FILE
5401 1818 00430 JR 541BH ;ELSE CONTINUE TO READ TAPE
00440 ;
00450 ;541B TWINKLES THE STARS AND CHECKS
00460 ;FOR CANCELED FUNCTION
00470 ;
5426 00480 ORG 5426H
5426 ED5B9D5E 00490 LD DE,(5E9DH) ;AND
00500 ;
542A 13 00500 INC DE ;INCREMENT
542B ED539D5E 00510 LD (5E9DH),DE ;IT
542F C3E753 00520 JP RDBLK1 ;CONTINUE READING TAPE
5432 3E00 00530 TAPFIN LD A,0H ;ZERO
5434 CD7B54 00540 CALL 547BH ;THE REMAINING
5437 10F9 00550 DJNZ TAPFIN ;BYTES OF THE BLOCK
5439 CD7B54 00560 CALL 547BH ;
543C C3D554 00570 JP 54D5H ;TO TURN OFF TAPE
00580 ;
00590 ;CASSETTE IF OFF INTERRUPTS ARE ON
00600 ;NOW ASK FOR DESTINATION FILESPEC
00610 ;
54D9 00620 ORG 54D9H
54D9 C3FC56 00630 JP 56FCH ;TO FILESPEC MESSAGE
00640 ;
00650 ;DISK FILE IS NOW OPEN STARTING WRITING TO DISK
00660 ;
5704 00670 ORG 5704H
5704 210052 00680 LD HL,5200H ;START OF FCB'S BUFFER
5707 110053 00690 LD DE,5300H ;FCB ITSELF
00700 ;
570A 0600 00700 LD B,0H ;256 BYTE RECORDS
570C CD2044 00710 CALL 4420H ;OPEN FILE
570F D9 00720 EXX ;SAVE ASSOCIATED FCB INFO
5710 219F5E 00730 LD HL,5E9FH ;FIRST BYTE OF TAPE BUFFER
5713 227453 00740 LD (5374H),HL ;PGM POINTER TO TAPE BUFFER
5716 2A9D5E 00750 LD HL,(5E9DH) ;ADJUST
5719 23 00760 INC HL ;BLOCK
571A 23 00770 INC HL ;COUNT
571B 229D5E 00780 LD (5E9DH),HL ;TO +1 OF TRUE VALUE
571E ED5B9D5E 00790 WRDSK1 LD DE,(5E9DH) ;CKECK
00800 ;
5722 1B 00800 DEC DE ;IF
5723 ED539D5E 00801 LD (5E9DH),DE ;
5727 7A 00810 LD A,D ;SECTOR
5728 B3 00820 OR E ;COUNT
5729 CA4557 00830 JP Z,WRDSK2 ;COMPLETED
572C 0E00 00840 LD C,0H ;ELSE SET FOR
572E 0601 00850 LD B,1H ;256 BUTE TRANSFER
5730 2A7453 00860 LD HL,(5374H) ;POINT FIRST BYTE TO TRANSFER
5733 110052 00870 LD DE,5200H ;FCB BUFFER FIRST BYTE
5736 EDB0 00880 LDIR ;MOVE A SECTORS WORTH OF DATA
5738 227453 00890 LD (5374H),HL ;STORE UPDATED POINTER TO BYTE
00900 ;
573B D9 00900 EXX ;FOR PROPER FCB INFO
573C CD3C44 00910 CALL 443CH ;WRITE A SECTOR
573F C29D5E 00920 JP NZ,5E9DH ;IF DISK ERROR
5742 D9 00930 EXX ;BACK TO TRANSFER POINTERS
5743 18D9 00940 JR WRDSK1 ;LOOP BACK FOR NEXT SECTOR
5745 D9 00950 WRDSK2 EXX ;ORIGINAL REGS
5746 CD2844 00960 CALL 4428H ;CLOSE FILE
5749 C35957 00970 JP 5759H ;TO DONE MESSAGE
0000 00980 END
00000 TOTAL ERRORS
32543 TEXT AREA BYTES LEFT

```

End



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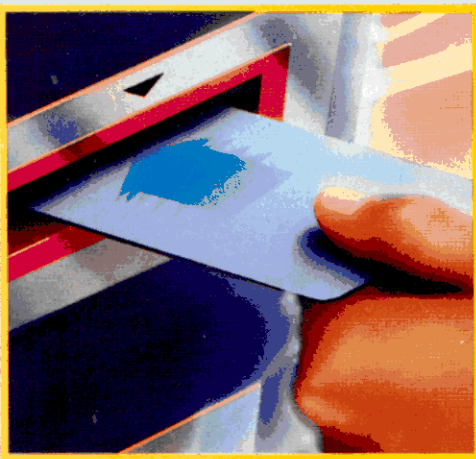
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You can selectively access data blocks in Basic programs by reassigning the data pointer.

Data Grabber

by David Goblen



As a Basic programmer, you might find that you want to access a specific block of data in a program. For instance, you may want to reuse data the program has already bypassed in its execution, or you might want to access data within a particular program area, like a program subroutine.

Unfortunately, you can't selectively access a block of data in a Basic program because Basic reads data blocks from beginning to end; it can't read data from the middle of a block or access data it has already passed.

Data Pointer, listed in both Basic and Assembly language, lets you set a target line so that your program can bypass unnecessary data and read only what you want (see Program Listings 1 and 2).

The Solutions

One way to remedy this problem is by using the Restore command to read all irrelevant data into an unused variable. This, however, is time-consuming, especially if your data comprises mixed variables, such as string and numeric variables, in an unpredictable format.

An easier way to solve the problem is to take advantage of the fact that the Models I and III read data from memory locations 40FF and 4100 hexadecimal (hex). If you POKE an address into these locations that is below that of the line number you want to use, the program begins reading data on the next data line it encounters.

Basic Line Structure

Basic stores programs in a uniform format, beginning at the location to

which addresses 40A4-40A5 hex point. The first 2 bytes of each program line store the integer address of the start of the next program line in least significant byte/most significant byte format. This is advantageous because you can use this information to search for a particular line more quickly than by scanning through the entire Basic line or by computing an offset from a line-length byte.

The next 2 bytes contain the line number. The text of the line follows this, with all reserved words stored in compressed-code format. The line is terminated by a 00H byte.

The Method

Data Pointer starts at the beginning of each line and scans the line number. If the line number doesn't match the target number, the program calculates the start of the next line and tests it in the same manner.

Once Data Pointer finds a match, it decrements the address pointer by 1, setting the pointer to the previous line's end-of-line marker. The program then POKES this value into 40FF and 4100 hex.

Program Listing 1 demonstrates a Basic version of this calculation as a subroutine. It begins reading data from a line other than the first data line. It sets the variable INFO to the line number for which you're looking, and calls the data line calculation routine in line 65000.

This routine sets the D1 variable to the starting address of the Basic program. Line 65010 scans each line, putting each line number into D2 and comparing it against INFO. If D1 and D2 don't match, the program updates D1 so that it points to the start of the next line, and reruns the scan. If D2 is

equal to INFO, the program subtracts 1 from D1, and POKES its value into 40FF and 4100 hex (16639-16640 decimal). On return, you can read the desired data line.

(Note that while the Restore command in line 40 isn't necessary in this type of application, I used it here to assure you that the pointer initially points to an address other than the target address.)

Program Listing 2 is the Assembly-language version of Data Pointer. The CALL 0A7FH command picks up the value that you enter into HL.

CALL 1B2CH scans Basic for a match to the line number in DE. The program returns the address of the line number sought in registers BC. It's then put to HL, decremented by 1, and loaded to the data pointer.

To use this routine, load it using disk or system tape, and set memory to one below the origin. Take the origin and set it to the USR address as demonstrated on pp. 8/8-8/12 of the *Level II Basic Reference Manual*, or pp. 191-192 of the *TRS-80 Model III Operation and Basic Language Reference Manual*.

For disk users this is defined as: DEF USR0=address, although you can change the origin to anything with which you feel comfortable. ■

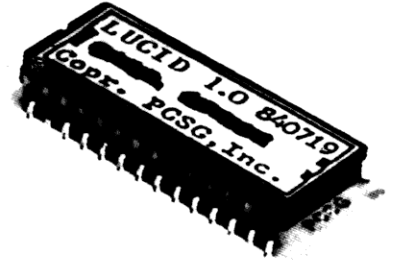
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```

110 'Demo program to show how to reprint the DATA start position
120 'David R. Goben
130
140 RESTORE 'Reset DATA pointer to start of BASIC
150 INFO = 180 'Point to line we wish to start reading from
160 GOSUB 65000 'Set pointer to start of line in 50
170
180 'Sample program that will use the subroutine
190
200 FOR X=1 TO 3
210 READ A(X)
220 NEXT X
230 FOR X=1 TO 3
240 PRINT A(X)
250 NEXT X
260 END
270 DATA 10, 20, 30
280 DATA 40, 50, 60
290 DATA 70, 80, 90
300
310 *****
320 64999 '*****
330 65000 D1=PEEK(16548) + PEEK(16549) *256
340 65010 D2=PEEK(D1 +2) + PEEK(D1 +3) *256:
350 IF D2 <> INFO THEN D1 = PEEK(D1) + PEEK(D1 +1) * 256:
360 IF D1 > 32767 THEN D1 =D1 - 65536:
370 GOTO 65010 ELSE 65010
380
390 65020 D1 = D1-1:
400 POKE 16639,D1 - INT(D1/256) * 256:
410 POKE 16640,INT(D1/256) :
420 RETURN
430 *****
440 65021 '*****

```

```

00100 ; *****;
00110 ; MODEL I / MODEL III;
00120 ; RESET DATA POINTER-----;
00130 ; *****;
00140 ; *****;
00150 ?
00160 ORG 32754
00170 RESTOR CALL @A7FH ;Get target number to HL
00180 EX DE:HL ;Put it to DE
00190 CALL 1B2CH ;Find Matching line number
00200 LD H,B ;Put line pointer to HL
00210 LD L,C
00220 DEC HL ;Make HL one less
00230 LD (40FFH),HL ;Set DATA pointer
00240 RET ;DONE!
00250 ?
00260 END
00000 Total Errors
00000
RESTOR 7FF2

```

130 • 80 Micro, November 1984

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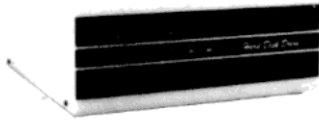
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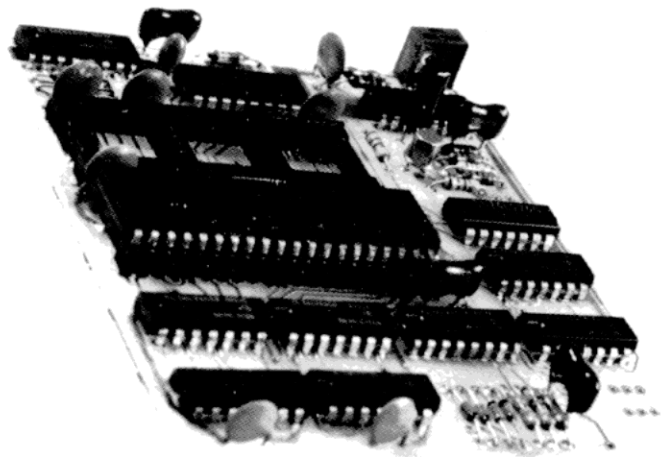
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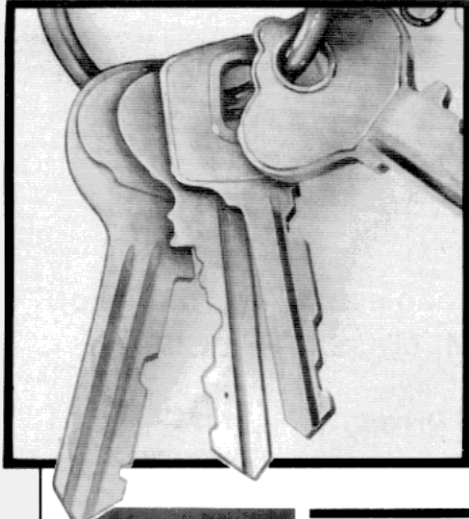
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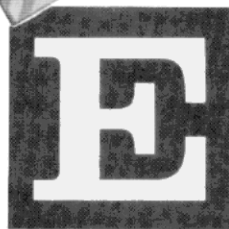
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Converter makes disk-to-disk file transfers between EDAS and EDTASM.

From EDAS to EDTASM and Back

by David M. Zevchak



DAS, Misosys's editor/assembler, provides a special command for loading

Radio Shack EDTASM files with EDAS, but no such command exists to do the reverse: load an EDAS file with EDTASM.

One solution is to make an EDAS source cassette tape using DTT, EDAS's disk-to-tape program, and load the tape using TPSRC, TRSDOS's tape-to-disk program. This disk-to-tape, tape-to-disk transfer process is tedious, but it lets you access desired EDAS files with EDTASM.

Rather than go through all that, I wrote Converter, a translator program that allows disk-to-disk file transfers between EDTASM and EDAS in either direction (see Program Listing 1). Converter runs on the Model III under TRSDOS 1.3, NEWDOS80 2.0, and LDOS 5.1.2 and requires 32K of RAM.

File Formats

Before looking at Converter, it's important to understand the differences between EDTASM and EDAS source files. Program Listing 2 is a sample program that I typed into EDTASM on TRSDOS 1.3, EDAS 3.5.2 on TRSDOS 1.3, and enhanced EDTASM on NEWDOS80 2.0.

Figure 1 shows how EDTASM stores that file on disk, and Fig. 2 shows EDAS's format. Notice that EDTASM lacks a D3H header byte at the beginning of the file and lacks the 6-byte file name following the D3 hexadecimal (hex) header byte.

Also, EDAS uses a 20H byte after line numbers, while EDTASM uses a 09H byte. Each line number consists

of individual digits of the line number strung together plus B0H. For example, the editor/assemblers translate the line number 00125 as B0H, B0H, B1H, B2H, and B5H.

Figure 3 displays NEWDOS80's enhanced EDTASM source file. A comparison between it and the EDAS source file reveals that they're completely compatible.

Converter

Converter translates files between EDAS and EDTASM formats. You specify an EDAS file as the input file and the output file is an EDTASM file; an EDTASM input file results in an EDAS output file and vice versa.

Converter first asks for the input source file. If the input file exists, it determines the type of file it is converting. If the file format doesn't meet either the EDAS or the EDTASM format, the program closes the input file and exits to DOS Ready.

If the input file is an EDAS or EDTASM file, Converter asks for an output file name. One caveat here: Don't specify the same file name for input and output files. Converter will write over your input source file. The program will then abort and return to DOS Ready, leaving you without an input or output file.

Assuming you've entered a unique output file name, Converter begins the translation. If you're converting an EDTASM file to an EDAS file, Converter opens the new file for output, writes a D3 hex header byte to the new file, and writes a null file name.

Following this is the line number from the original file and a 20 hex address follower byte. The rest of the original file data follows.

When converting an EDAS file to

EDTASM, Converter reads over the D3 hex header byte and the file name. It then opens the new file and transfers the line number. Converter replaces the 20 hex address follower with a 09 hex address follower, then transfers the rest of the data for that line.

If, during the translation of the source file the program discovers a file error, it saves the portion of the file already translated to the output file and exits to DOS Ready.

Figure 4 represents the original EDTASM source file translated into EDAS format. Notice the null file name (six blank spaces) that the program assigns to the file.

The lack of an internal file name in the EDAS file isn't a problem when loading to the EDAS disk editor/assembler, but can cause problems if you transfer the file to tape after the translation and try to load it.

You can handle this by loading the file into the editor/assembler and saving it back again (this replaces the null name with a real name) or by changing the 20 hex byte in line 10010 to a literal character, such as A. This will give all your files the internal file name AAAAAA.

The internal file name has no bearing on loading the file-to-disk editor/assembler because it looks only at the name in the directory. ■

Contact David M. Zevchak at 143 W. Leyte, Mishawaka, IN 46545.

The Key Box

Model III
32K RAM
Assembly Language
Editor/Assembler



```

000100: B0B0 B0B1 B009 3B20 5448 4953 2049 5320 .....; THIS IS
000110: 4120 5445 5354 204F 4620 5448 4520 4544 A TEST OF THE ED
000120: 5441 534D 2041 4E44 2045 4441 5320 4544 TASM AND EDAS ED
000130: 4954 4F52 2F41 5353 454D 424C 4552 530D ITOR/ASSEMBLERS.
000140: B0B0 B0B2 B009 094F 5247 0937 3030 3048 .....ORG.7000H
000150: 0DB0 B0B0 B3B0 093B 0DB0 B0B0 B4B0 0909 .....;
000160: 4C44 0941 2C42 0909 3B4C 4F41 4420 5245 LD.A,B.;LOAD RE
000170: 4720 4220 494E 544F 2052 4547 2041 0DB0 G B INTO REG A..
000180: B0B0 B5B0 0909 414E 4409 3034 4809 093B .....AND.04H.;
000190: 6C6F 6769 6361 6C20 616E 6420 7265 6720 logical and reg
0001A0: 4120 616E 6420 3034 480D B0B0 B0B6 B009 A and 04H.....
0001B0: 0945 4E44 0D1A 0000 0000 0000 0000 0000 .END.....
0001C0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
0001D0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
0001E0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
0001F0: 0000 0000 0000 0000 0000 0000 0000 0000 .....

```

Figure 1. EDTASM file stored on disk.

```

000100: 0954 4553 5420 20B0 B0B0 B1B0 203B 2054 .TEST .....; T
000110: 4849 5320 4953 2041 2054 4553 5420 4F46 HIS IS A TEST OF
000120: 2054 4845 2045 4454 4153 4D20 414E 4420 THE EDTASM AND
000130: 4544 4153 2045 4449 544F 522F 4153 5345 EDAS EDITOR/ASSE
000140: 4D42 4C45 5253 0DB0 B0B0 B2B0 2009 4F52 MBLERS.....OR
000150: 4709 3730 3030 480D B0B0 B0B3 B020 3B0D G.7000H.....;
000160: B0B0 B0B4 B020 094C 4409 412C 4209 093B .....LD.A,B.;
000170: 4C4F 4144 2052 4547 2042 2049 4E54 4F20 LOAD REG B INTO
000180: 5245 4720 410D B0B0 B0B5 B020 0941 4E44 REG A.....AND
000190: 0930 3448 0909 3B6C 6F67 6963 616C 2061 .04H.;logical a
0001A0: 6E64 2072 6567 2041 2061 6E64 2030 3448 nd reg A and 04H
0001B0: 0DB0 B0B0 B6B0 2009 454E 440D 1A00 0000 .....END.....
0001C0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
0001D0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
0001E0: 0000 0000 0000 0000 0000 0000 0000 0000 .....
0001F0: 0000 0000 0000 0000 0000 0000 0000 0000 .....

```

Figure 2. EDAS file stored on disk.

```

DRV 00 D354 4553 5420 20B0 B0B0 B1B0 203B 2054 .TEST.....; T
0 10 4849 5320 4953 2041 2054 4553 5420 4F46 HIS IS A TEST OF
0H 20 2054 4845 2045 4454 4153 4D20 414E 4420 THE EDTASM AND
30 4544 4153 2045 4449 544F 522F 4153 5345 EDAS EDITOR/ASSE
DRS 40 4D42 4C45 5253 0DB0 B0B0 B2B0 2009 4F52 MBLERS.....OR
415 50 4709 3730 3030 480D B0B0 B0B3 B020 3B0D G.7000H.....;
19FH 60 B0B0 B0B4 B020 094C 4409 412C 4209 093B .....LD.A,B.;
70 4C4F 4144 2052 4547 2042 2049 4E54 4F20 LOAD REG B INTO
80 5245 4720 410D B0B0 B0B5 B020 0941 4E44 REG A.....AND
90 0930 3448 0909 3B6C 6F67 6963 616C 2061 .04H.;logical a
A0 6E64 2072 6567 2041 2061 6E64 2030 3448 nd.reg.A.and.04H
B0 0DB0 B0B0 B6B0 2009 454E 440D 1A00 0000 .....END.....
FRS C0 0000 0000 0000 0000 0000 0000 0000 .....
D0 0000 0000 0000 0000 0000 0000 0000 .....
0H E0 0000 0000 0000 0000 0000 0000 0000 .....
F0 0000 0000 0000 0000 0000 0000 0000 .....

```

Figure 3. NEWDOS80 enhanced EDTASM source file.

```

000100: D320 2020 2020 20B0 B0B0 B1B0 203B 2054 . .....; T
000110: 4849 5320 4953 2041 2054 4553 5420 4F46 HIS IS A TEST OF
000120: 2054 4845 2045 4454 4153 4D20 414E 4420 THE EDTASM AND
000130: 4544 4153 2045 4449 544F 522F 4153 5345 EDAS EDITOR/ASSE
000140: 4D42 4C45 5253 0DB0 B0B0 B2B0 2009 4F52 MBLERS.....OR
000150: 4709 3730 3030 480D B0B0 B0B3 B020 3B0D G.7000H.....;
000160: B0B0 B0B4 B020 094C 4409 412C 4209 093B .....LD.A,B.;
000170: 4C4F 4144 2052 4547 2042 2049 4E54 4F20 LOAD REG B INTO
000180: 5245 4720 410D B0B0 B0B5 B020 0941 4E44 REG A.....AND
000190: 0930 3448 0909 3B6C 6F67 6963 616C 2061 .04H.;logical a
0001A0: 6E64 2072 6567 2041 2061 6E64 2030 3448 nd reg A and 04H
0001B0: 0DB0 B0B0 B6B0 2009 454E 440D 1A42 4C45 .....END..BLE
0001C0: 5220 4150 5045 4E44 4147 452C 2056 4552 R APPENDAGE, VER
0001D0: 5349 4F4E 2033 2E30 0DA0 4F42 4A45 4354 SION 3.0.OBJECT
0001E0: 2046 494C 4520 544F 2044 4953 4B20 4F52 FILE TO DISK OR
0001F0: 2054 4150 453F 2020 2844 204F 5220 5429 TAPE? (D OR T)

```

Figure 4. Converted EDTASM file.

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Listing 1 continued

Listing 1 continued

Listing 1 continued

```

01400 ;
01410 BADFL LD HL,BADFL
01420 VDLIN CALL VDLIN
01430 JR ENL
01440 ;
01450 OPEN1 LD HL,FILSP1
01460 CALL VDLIN
01470 LD HL,FILNM1
01480 LD B,30
01490 CALL KBLIN
01500 JR C,END1
01510 LD HL,FILNM1
01520 LD DE,DCB1
01530 CALL SYNTX
01540 JR Z,GDNAM
01550 ;
01560 LD HL,BADNM
01570 CALL VDLIN
01580 JR OPEN1
01590 LD DE,DCB1
01600 LD B,0
01610 LD HL,DSKBF1
01620 CALL OPEN
01630 RET Z
01640 ;
01650 ERREND OR 0C0H
01660 CALL ERROR1
01670 ENL1 CALL CLOSE
01680 JP DOS
01690 ;
01700 OPEN2 LD HL,FILSP2
01710 CALL VDLIN
01720 LD HL,FILNM2
01730 LD B,30
01740 CALL KBLIN
01750 JR C,END1
01760 LD HL,FILNM2
01770 LD DE,DCB2
01780 CALL SYNTX
01790 JR NZ,BDNAM1
01800 LD HL,DSKBF2
01810 LD DE,DCB2
01820 LD B,0
01830 CALL INIT
01840 RET Z
01850 ERREND
01860 BDNAM1 LD HL,BADNM
01870 CALL VDLIN
01880 JR OPEN2
01890 ;
01900 ;
01910 DSKOUT PUSH DE
01920 BC
01930 PUSH DE,DCB2
01940 LD PUT
01950 JR NZ,ERREND
01960 BC
01970 POP BC
01980 RET
01990 ;
02000 DSKIN PUSH DE
02010 BC
02020 LD DE,DCB1
02030 CALL GET
02040 JR NZ,ERREND
02050 POP BC
02060 POP DE
02070 RET
02080 ;
02090 CLOSE LD DE,DCB1
02100 CALL CLOSE1

```

Program Listing 2. Demonstration program.

```

00010 ; THIS IS A TEST OF THE EDTASM AND EDAS EDITOR/ASSEMBLERS
00020 ORG 7000H
00030 ;
00040 LD A,B
00050 AND 04H
00060 END

```

End

End



Change your DOS's Kill command (or any other library command) to one that more closely suits your taste.

Thou Shalt Not Kill

by Josef Friedman



political terrorist kills a hostage. A TRS-80 owner kills a file. You might

sense there's something wrong with our language when we use the same word to describe such disparate events.

If you object to the use of words like "kill" as a library command, or if you're tired of using the same Model I/III library commands, you can rename them in just a few minutes using the techniques I'll describe here.

With a monitor program like Diskzap (for DOSPLUS), Super Utility Plus (for TRSDOS), Zap (for MULTIDOS), or Superzap (for NEWDOS-80), you can change Kill or any other library command to suit your taste.

The theory behind changing the Kill command is common to all the DOSes. In each case, you need the command's track and sector locations; you'll find them in the Table. As an example, I'll describe how to change the Kill command in DOSPLUS 3.4 in detail and give you a brief account for each of the other DOSes.

Some DOSes provide a Help file that describes how to use library commands. You should change this file to reflect the renamed library command.

DOSPLUS 3.4

DOSPLUS 3.4 (for the Models I

The Key Box

Models I and III
DOSPLUS 3.4 and 3.5
TRSDOS 2.3 and 1.3
MULTIDOS 1.4 and 1.6
NEWDOS80 2.0

and III) includes a Diskzap monitor that finds the Kill command at cylinder 10 hexadecimal (hex), sector 2 hex.

Figure 1 is a screen dump of sector 10 on a DOSPLUS 3.4 disk. The first two numbers in the left-hand column represent the track number, the second two numbers are the sector number, and the last two numbers represent the hex address of the first byte on the line. Following that is a dump of the sector from bytes 00-FF.

To the right is the ASCII display area. (DOSPLUS 3.4 represents non-printable characters on the screen as a period.) The Kill command is obvious in line 20. I changed it to REMV for "remove," abbreviating to stay within the original four-character limit.

You can change the Kill command with the monitor's Modify command (M) by substituting the appropriate hex characters from an ASCII conversion table. If your monitor includes an ASCII (A) option, you can make the change by inserting REMV in place of KILL. Look at Fig. 2 to see the result.

DOSPLUS 3.4 has no Help command to change.

DOSPLUS 3.5

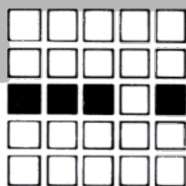
DOSPLUS 3.5 provides Diskzap, too. In the Model III, DOSPLUS 3.5 stores the library commands at track 13 hex, sector 4 hex. In the Model I, it stores the commands at track 10 hex, sector 9 hex.

DOSPLUS 3.5 command-name changes are more complicated than those of other DOSes because DOSPLUS 3.5 adds 80 hex to the first character of each command. This makes that character appear as a period in the ASCII column.

DOSPLUS 3.5 represents the K in Kill as CB (4B hex plus 80 hex), not 4B (4B hex is the ASCII code for the letter "K"). Since the ASCII code for R is 52 hex, you can insert D2 (52 hex + 80 hex) in place of CB. Then use the ASCII option to change ILL to EMV. In the Model III, DOSPLUS 3.5's Help file resides at track 11 hex, sector 8 hex. In the Model I, it resides at track 0E hex, sector 2 hex.

DOS	Monitor	Command	Help	Miscellaneous
DOSPLUS 3.4	Diskzap	10 hex, 2 hex	No	No
DOSPLUS 3.5	Diskzap	13 hex, 4 hex	11 hex, 8 hex	Query 19 hex, 0C hex
TRSDOS 2.3	SuperU	16, 1	No	No
TRSDOS 1.3	SuperU	16, 4	19, 10	Lib 19, 2 Mess. 20, 5
MULTIDOS 1.4	Zap	16, 9	19, 14, and 15	No
MULTIDOS 1.6	Zap	18, 4	21, 14	No
NEWDOS80 2.0	Superzap	163	No	No

Table. Track and sector locations needed to change DOSPLUS, TRSDOS, MULTIDOS, and NEWDOS80 library commands.



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DOSPLUS 3.5 requires one additional zap. The Kill command has a query option. You must zap the KILL? query to REMV?. You'll find this at track 19 hex, sector 0C hex in the Model III and at track 16 hex, sector 9 hex in the Model I.

TRSDOS 2.3 and 1.3

You'll have to make TRSDOS changes with a separate monitor program, since TRSDOS doesn't provide one and its Debug utility can't access system files. You can use Super Utility Plus or any other such monitor program.

You'll find the Model I's TRSDOS 2.3 library commands at track 16, sector 1.

TRSDOS 1.3 (for the Model III) contains several areas that support the library commands. Track 16, sector 4 contains the commands; track 19, sector 2 contains the word listings for the LIB command. Track 19, sector 10 contains the command descriptions for the Help command. Track 20, sector 5 contains the screen message "Killing."

MULTIDOS 1.4 and 1.6

MULTIDOS 1.4 (for the Model I) has the library commands at track 16, sector 9 and the Help file at track 19, sectors 14 and 15.

MULTIDOS 1.6 for the Model III has the library commands at track 18, sector 4 and the Help descriptions at track 21, sector 14.

NEWDOS80 2.0

NEWDOS80 includes the Superzap monitor program which will find the Kill command at disk relative sector 163. ■

You can reach Josef Friedman at the department of math and computer science, Western Connecticut State University, 181 White St., Danbury, CT 06810.

```

100200: 464F 5243 4520 B64E 464F 524D 5320 B74E FORCE .NFORMS .N
100210: 4652 4545 2020 B94E 4A4F 494E 2020 B64E FREE .NJOIN .N
100220: 4B49 4C4C 2020 B54E 4C49 4220 2020 BA4E KILL .NLIB .N
100230: 4C49 5354 2020 B54E 4C4F 4144 2020 B54E LIST .NLOAD .N
100240: 5041 5553 4520 BA4E 5052 4F54 2020 B74E PAUSE .NPROT .N
100250: 5245 4E41 4D45 B44E 5253 3233 3220 BA4E RENAME.NRS232 .N
100260: 5449 4D45 2020 BA4E 5645 5249 4659 BA4E TIME .NVERIFY.N
100270: 00D5 0608 CD6A 5020 37FE 2F20 0912 1306 .....jP 7./ ....
100280: 03CD 6A50 2037 FE2E 2009 1213 0608 CD6A ...jP 7... ..j
100290: 5020 2AFE 3A20 0912 1306 02CD 6A50 201D P *.: .....jP .
1002A0: 3E03 12D1 D501 EE51 CDA6 50D1 28C3 AF01 >.....Q..P.(...
1002B0: 00FC 4FC9 FE2A 2009 1213 0602 CD6A 5028 ...O.* .....jP(
1002C0: E3D1 C93A B842 4F7E 23FE 2028 FAFE 3A20 ....BO"#. (...
1002D0: 197E 23D6 30D8 4F3A B742 3DB9 D87E 23CB ...#.O.:B=...#.
1002E0: AFPE 4128 04FE 4220 0123 2BAF C9D5 E5EB ..A{..B .#+.....
1002F0: 2306 097E FE2F 280D 380E FE3A 3804 FE41 #..../(.8...8..A

```

Figure 1. Hex dump of DOSPLUS 3.4, track 10 hex, sector 2 hex. The Kill command is in line 20.

```

100200: 464F 5243 4520 B64E 464F 524D 5320 B74E FORCE .NFORMS .N
100210: 4652 4545 2020 B94E 4A4F 494E 2020 B64E FREE .NJOIN .N
100220: 5245 4D56 2020 B54E 4C49 4220 2020 BA4E REMV .NLIB .N
100230: 4C49 5354 2020 B54E 4C4F 4144 2020 B54E LIST .NLOAD .N
100240: 5041 5553 4520 BA4E 5052 4F54 2020 B74E PAUSE .NPROT .N
100250: 5245 4E41 4D45 B44E 5253 3233 3220 BA4E RENAME.NRS232 .N
100260: 5449 4D45 2020 BA4E 5645 5249 4659 BA4E TIME .NVERIFY.N
100270: 00D5 0608 CD6A 5020 37FE 2F20 0912 1306 .....jP 7./ ....
100280: 03CD 6A50 2037 FE2E 2009 1213 0608 CD6A ...jP 7... ..j
100290: 5020 2AFE 3A20 0912 1306 02CD 6A50 201D P *.: .....jP .
1002A0: 3E03 12D1 D501 EE51 CDA6 50D1 28C3 AF01 >.....Q..P.(...
1002B0: 00FC 4FC9 FE2A 2009 1213 0602 CD6A 5028 ...O.* .....jP(
1002C0: E3D1 C93A B842 4F7E 23FE 2028 FAFE 3A20 ....BO"#. (...
1002D0: 197E 23D6 30D8 4F3A B742 3DB9 D87E 23CB ...#.O.:B=...#.
1002E0: AFPE 4128 04FE 4220 0123 2BAF C9D5 E5EB ..A{..B .#+.....
1002F0: 2306 097E FE2F 280D 380E FE3A 3804 FE41 #..../(.8...8..A

```

Figure 2. Hex dump of DOSPLUS 3.4 with Kill changed to REMV.



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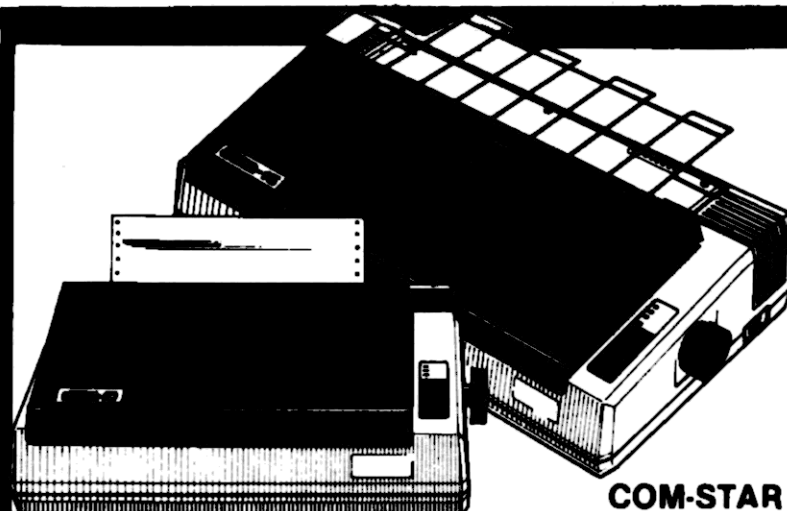
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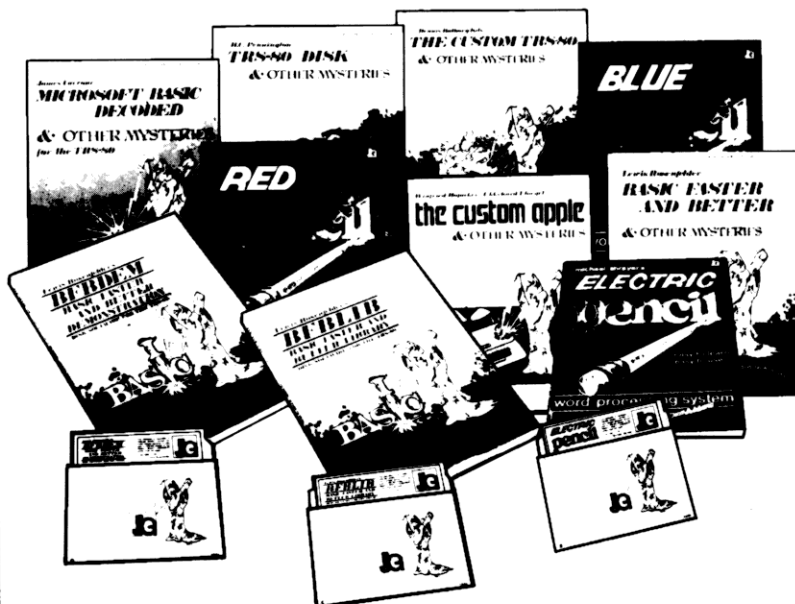
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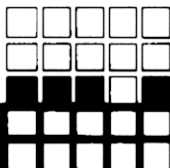
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Talk of the Town: A 300-Baud Modem

Telecommunications plays an important role in computing. This is obvious from the response I got to the January 1984 Project 80, "Hardware That Communicates," (p. 197) that described how to build an RS-232C serial communications board.

If you want your computer to communicate with another system, you have to use a modem with your serial port. The modem converts the signal from the serial board to one the telephone system can handle. The computer at the receiving end must also have a modem to convert the signals back. I'll show you how to build a 300-baud modem for this purpose.

You can use a modem with any computer that has an RS-232C serial communications interface. Because it's a standard interface, even non-Radio Shack systems can use it. There are no minimum system configuration requirements.

The modem will use a new modem integrated circuit (IC) from National Semiconductor, the 74HC943, which has nearly all of the functions of a 300-baud modem on-chip. It requires surprisingly little support circuitry to make a complete direct-connect modem.

Modem Basics

If you're not familiar with the basics of serial communications, I recommend that you dig up your January 1984 *80 Micro* and review that issue's Project 80 (p. 197).

As you might recall, serial ports output a serial bit stream at a specified baud (bits-per-second) rate. The baud rate at the receiving end must match these parameters. Since the 1 and zero values output from the serial port are represented by voltages, you can't directly connect the output of a serial port to the telephone lines. The phone company wouldn't be pleased if you tried to send voltages over their lines.

The phone system is, however, set up for communicating sound (fre-

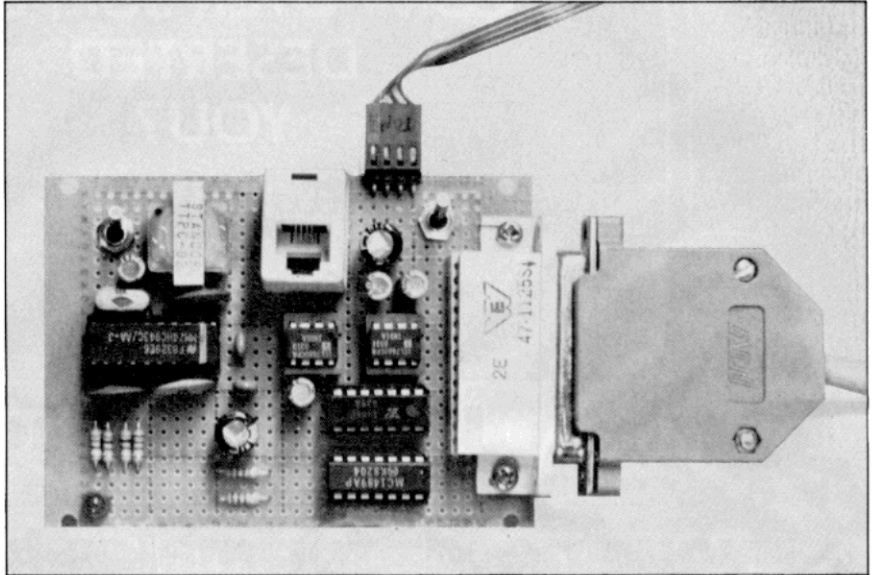


Photo. Completed 300-baud direct-connect modem.

quencies) from one place to another. A modem converts the 1 and zero voltages from a serial port into predetermined frequencies, and puts these frequencies on the phone lines where they can be picked up on the other end. The receiving modem must also send its 1 and zero values as frequencies, but these must differ to keep them from being confused with those from the first modem.

Because these frequencies must be different, the first modem must be an originate modem, while the second must be an answer modem. The originate modem transmits a logical 1 (mark) value as a 1,270 Hz tone, and a logical zero (space) value as a 1,070 Hz tone. Similarly, the answer modem transmits a mark as a 2,225 Hz tone and a space as a 2,025 Hz tone. So that these two modems can work together, the originate modem receives marks and spaces at 2,225 Hz and 2,025 Hz, while the answer modem receives marks and spaces at 1,270 Hz and 1,070 Hz.

The names given to the modems, originate and answer, have no real meaning other than to indicate their

typical uses. Since the system you're calling will generally answer using the frequencies of an answer modem, you must use the originate frequencies. Almost all (if not all) commercial and university time-sharing systems and networks (including *80 Micro's* BBS) will answer a call using the frequencies of an answer modem. You will nearly always want your own modem configured as an originate unit. The modem described in this column lets you select either mode.

The MM74HC943 300-Baud Modem Chip

The heart of this month's project is the 20-pin MM74HC943 modem chip from National Semiconductor. This chip incorporates all the functions of a 300-baud modem (including filters) on a single chip, requiring only external resistors and capacitors for a full functioning modem. You can add a special line transformer to permit direct-connection operation to the telephone lines. Also, because the modem chip is made using high-speed CMOS processes, it consumes little power.

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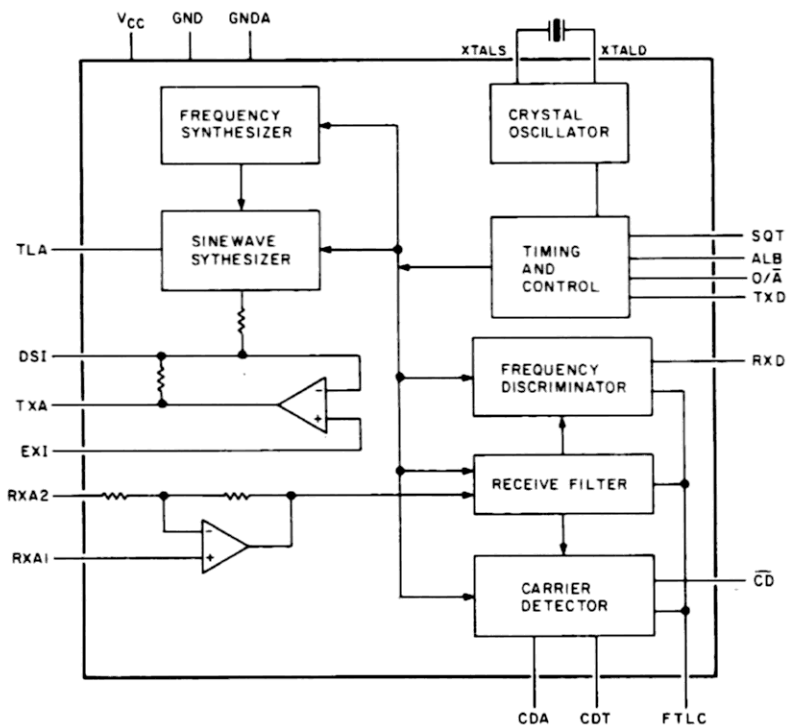


Figure 1. 74HC943 block diagram.

As shown in the block diagram of the 74HC943 (see Fig. 1), the chip requires an external crystal for frequency synthesis and detection. It also provides a carrier detect (CD/) signal to indicate when a carrier is being received from a remote modem. The modem interfaces to external circuitry using CMOS level signals. They are not exactly TTL-compatible signals, which the modem design must take into account.

Constructing the Modern

The schematic for the modem board is shown in Fig. 2. The power connections for the ICs are shown in Table 1, while Fig. 3 shows the tie-ups for unused gates. Also, the completed modem is shown in the accompanying photo. Building the modem from the schematic is straightforward.

The 1488 converts the CMOS output level of the 74HC943 to RS-232C voltage levels (+5V to -5V voltage swing in this particular case). To put out a minus voltage, the 1488 requires a minus voltage applied to its pin 1. As shown in the schematic, two cascaded ICL7660 ICs are used as +5V to -5V converters. The output of the second ICL7660 goes to pin 1 of the 1488, giving the required minus voltage. If you

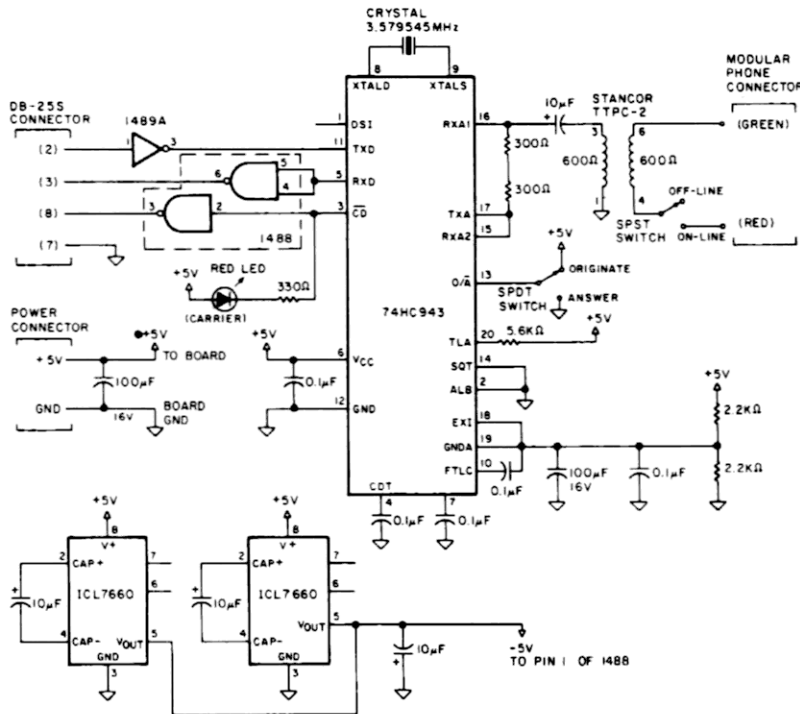


Figure 2. 300-baud modem schematic.

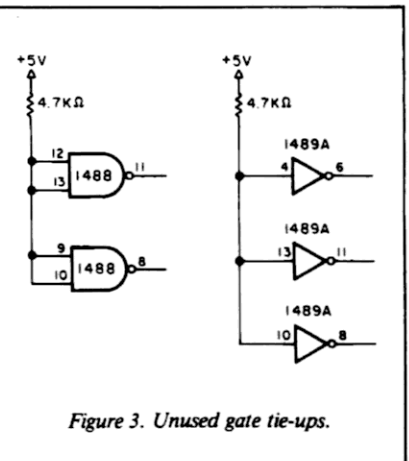


Figure 3. Unused gate tie-ups.

IC	GND	+5V	-5V
74HC943	12	6	
1488	7	14	1
1489A	7	14	
ICL7660	3	8	

Table 1. IC power connections.

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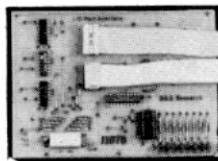
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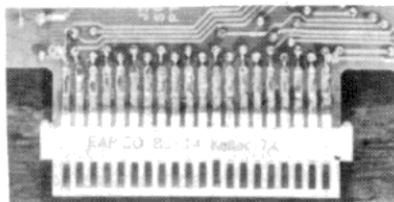
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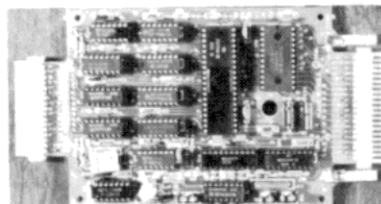
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have a -5V power supply available, you may eliminate the ICL7660's and the three respective 10 microfarad capacitors.

Output pin 5 of the 74HC943 is the receive data pin (RxD). This pin puts out the 1 or zero bit corresponding to the frequency being received from the remote modem. The RxD signal goes to a 1488 gate you convert to the appropriate RS-232C voltage level, and you connect the resulting signal to pin 3 of the DB-25S connector. Your computer can then read the incoming data into its RS-232C port by connecting to the DB-25S with an appropriate cable.

Pin 3 on the 74HC943 is the carrier detect (CD/) signal. This signal goes active (low) when a carrier is detected from the remote modem. This is set up to turn on an LED (light-emitting diode), and is also returned to the computer on pin 8 of the DB-25S connector (after being converted to the appropriate RS-232C voltage level).

Being CMOS, the 74HC943's minimum input high voltage requirement (VIH) is less than the maximum

guaranteed by a TTL-level driver (such as the 1489A). To assure a high enough output voltage, place a 10k pull-up resistor on the output of the 1489A gate to the 74HC943. The 1489A gate receives the transmitted signal from the computer's serial port on pin 2 of the DB25S and converts it from its RS-232C voltage level to the corresponding TTL level (then CMOS, with the pull-up resistor), giving the modem chip the proper signal to generate the desired output tone.

The transformer is a special 600 ohm/600 ohm telephone line coupling transformer, designed to meet FCC Part 68 requirements. This transformer lets you connect the modem directly to the telephone lines. As shown in the schematic, the transformer connects to two of the wires of a modular phone connector (the middle two—TIP and RING—green and red). These lines are interchangeable in this application.

I used a Radio Shack female-female modular phone connector (see Photo and parts list in Table 2) for my board.

The connector is actually two modular connectors glued together. Separate the two parts at the seam and cut the internal wires. Use the red and green wires for the transformer connection.

The modem board has two switches, one to select the originate or answer mode (as discussed above) and one to put the modem on the telephone line.

The 5.6k resistor connected to the TLA pin (pin 20) of the 74HC943 determines the signal level output of the modem. The resistor value specified is for the maximum signal level of the 74HC943 (-9dBm [decimal reference level of 1 milliwatt over 600 ohm]). Most phone systems provide about 3dB of attenuation from a phone to the exchange, thus a maximum signal level of -12dBm would reach the exchange. This is the maximum level permitted by most phone companies.

You will also need a +5V @50 milliamp power supply to run the modem board.

Operating the Modem

As I mentioned earlier, you can select between answer and originate modes by using the toggle switch going to pin 13 of the 74HC943. The second toggle is an on-line/off-line switch, letting you connect the modem to the phone line.

I should mention that all devices connected to the phone lines are supposed to have FCC approval. Although all the parts in this project meet the FCC Part 68 specifications, the project isn't FCC-approved. Neither I nor *80 Micro* take responsibility for using the modem without FCC approval.

To use the modem, you'll also need a two-to-one modular adapter (see the parts list in Table 2). This adapter will plug into the modular socket on the modem board, giving you two modular sockets on the board. You should connect a telephone to one of the sockets and a wire going to the telephone line jack to the other.

To call another computer system, make sure the answer/originate mode switch is properly set (usually in the originate mode); then dial the other system's phone number with the telephone (making sure the modem is in the off-line mode). When you get the answer tone from the remote modem, alter the modem switch to on-line and

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2	ICL7660 DC positive to negative voltage converter IC	RS	276-2335	3.79
1	LM1488 Quad RS-232C driver IC	JDR	LM1488	.69
1	LM1489A Quad RS-232C receiver IC	JDR	LM1489	.69
1	3.579545 MHz crystal	DK	X049	1.50
2	100 μ F/35V electrolytic capacitor (PC mount)	RS	272-1028	.79
4	10 μ F/35V electrolytic capacitor (PC mount)	RS	272-1025	.59
5	.1 μ F/50V disk capacitor	RS	272-135	.25
1	330 ohm resistor (1/4 watt)	RS	271-1315	.08
1	5.6k ohm resistor (1/4 watt)	DK		.05
2	2.2k ohm resistor (1/4 watt)	RS	271-1325	.08
2	4.7k ohm resistor (1/4 watt)	RS	271-1330	.08
2	300 ohm resistor	DK		.05
1	10k ohm resistor (1/4 watt)	RS	271-1335	.08
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1	Red light emitting diode (LED)	RS	276-041	.35

Table 2. Parts list and ordering information.

PROJECT 80

hang up. The carrier-detect light should now go on, indicating receipt of the remote carrier. If the modem is properly connected to your RS-232C board (and your appropriate system software is running), you should now be able to communicate with the remote system.

To end your communications with the remote system, merely switch the modem back to off-line. When the modem is off-line, you can use the phone normally. ■

I would like to thank David Miner, field applications engineer for National Semiconductor, for his help in providing necessary technical assistance in the development of this project.

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A Closer Look at Messages And Data-Base Files

Your message board is looking good; it can now accommodate a range of special-interest topics and handle specific requests. Last month's BBS Express gave you the code to read and write headers. This month we'll discuss messages and data-base files in detail.

First, we'll clear up a few problems concerning storage. Your BBS stores headers of fixed length in a random-access file. Because messages are also of fixed length (20 lines of 64 characters), you can store them in the same manner.

Data-base files, on the other hand, aren't of fixed length; their size is limited only by disk space. Therefore, you can't store them in random-access files. Instead of writing two routines, one for data-base files and another for messages, we've decided to simplify matters (and save disk space) by storing them in individual sequential ASCII files.

Carriage Returns

Sequential disk files become slightly more complicated where carriage returns are concerned. The PRINT# (file number) command writes data into a sequential file, while the INPUT# or LINE INPUT# commands retrieve data. PRINT# works with the disk the way the Print command works with the screen. That is, if there's a semicolon, the BBS program doesn't print a carriage return. If, on the other hand, a semicolon doesn't follow, the program adds a carriage return.

Look, for instance, at the string in the following example:

```
10 OPEN"O",1,"TEST/DAT:0"
20 LET A$="Hi there, sports fans"
30 PRINT#1,A$
40 CLOSE
50 END
```

This prints "Hi there, sports fans (CR)" on disk. If you insert a semicolon at the end of line 30, the pro-

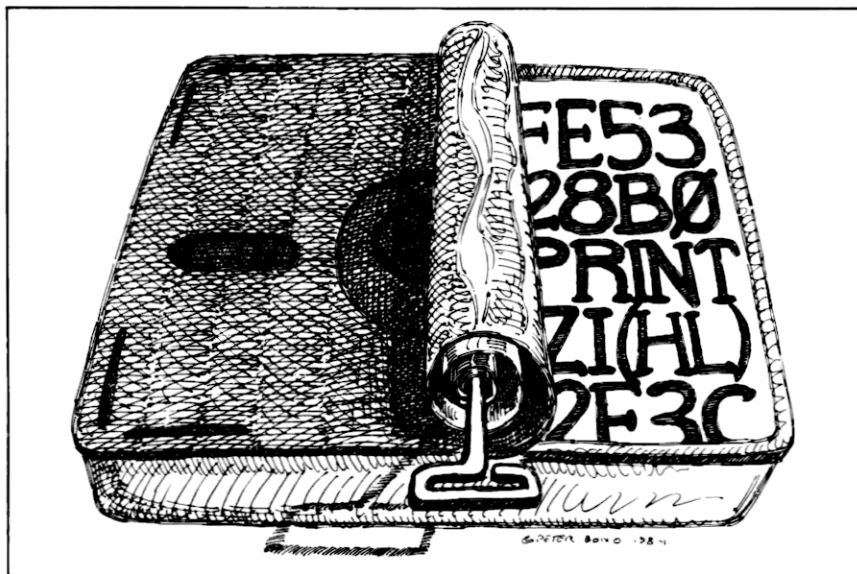


Illustration by Peter Bono

gram prints the string without the carriage return.

The following example removes the message from the disk and puts it onto the screen:

```
10 OPEN"1",1,"TEST/DAT:0"
20 INPUT#1,A$;PRINTA$
30 CLOSE
```

This listing prints only "Hi there," because INPUT#1 stops inputting at the comma, which is a string terminator. If you change line 20 to LINE INPUT#1,A\$, the program prints the entire string. This is important because the BBS messages are divided into paragraphs, each with a carriage return at the end.

So that Basic won't interpret an unwanted carriage return, we chose a substitute, CHR\$(141), because it can't be sent from a remote system. The program sends messages sent to disk with PRINT#, changing all the carriage returns to CHR\$(141)s.

One other problem surfaces when you use carriage returns as line terminators. This exists when a caller enters a carriage return for another line after

reaching the 64-character limit. It's necessary to differentiate between a carriage return that signals the end of a line and one that signals the end of a paragraph.

The BBS Express does this by considering the indentation. For example, the program checks to see if the next line of text is indented. If it is, the program writes the carriage return in the previous line to disk as CHR\$(141). If the line isn't indented, the program changes the carriage return to a space. The resulting string is written to disk with a PRINT# command, followed by a semicolon, and read in with a LINE INPUT# command. You can see this at work in line 3420 of Program Listing 1.

Writing a Message to Disk

Listing 1 is what remains of the writing routine started last month.

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Program Listing 1. BBS module for writing data-base files and messages to disk.

```

3350 PRINT"Correct (y/n)?";GOSUB130:PRINTCHR$(17)
3360 IFASC(I$)=78 THEN 3290
3370 IFASC(I$)<>89 THEN 3350
3380 CLS:PRINTCHR$(12);"Please enter your message now.":PRINT"Up t
o 20 lines, 64 characters per line.":PRINT"Enter a blank line to s
ignal the end of message":S=1
3390 TL=0:NC=-1:POKE M9,64:" set max line length
3400 FOR LN=STO20
3410 PRINTCHR$(17):PRINTLN;": ";GOSUB130:IF CT>64 THEN PRINTCHR$(
17);"No more than 64 characters per line, please":GOTO 3410
3415 IF ASC(I$)=141 THEN 3450
3420 IF LN>1 THENCR=INSTR(MG$(LN-1),CHR$(141)):IF ASC(I$)<>32 AND
CR>0 THEN MID$(MG$(LN-1),CR,1)=CHR$(32)
3430 LSET MG$(LN)=I$:MG(LN)=CT
3440 NEXT LN
3450 PRINTCHR$(17):LN=LN-1:PRINT:PRINT"Leave Options: "
3460 NC=0:TL=-1:PRINT"Subcommand (? for HELP): ";GOSUB130:PRINTCH
R$(17):IF CT=0 THEN 3460
3470 C$=LEFT$(I$,CT)
3480 ONINSTR("SLRADCS",C$) GOTO3520, 3650, 3660, 3620, 3660,3510,
3500
3490 PRINT"? - Prints this list":PRINT"S - Stores message":PRINT"S
P - Store Private Message":PRINT"A - Abort message":PRINT"R - Repl
ace Line":PRINT"L - List Message":PRINT"D - Delete line":PRINT"C -
Continue entering text":GOTO3460
3500 S7$=CHR$(32):GOTO3520
3510 S=LN+1:IF S>20 THEN 3460 ELSE CLS:PRINTCHR$(12):GOTO3390
3520 IF B THEN RETURN
3530 M2=M2+1:SH=SH+1:IF SH>9999 THEN SH=1
3540 MN=SH:A$="MSG0000/BBS"+DD$:GOSUB860
3550 OPEN"O",3,A$
3560 FOR Z=1TOLN
3570 IF MG(Z)>0 THEN PRINT#3,LEFT$(MG$(Z),MG(Z));
3580 NEXT Z:PRINT"Message";SH;"stored...":CLOSE 3
3590 SN=SN+1
3600 MN$=MN$+MKI$(VAL(N$))
3620 PRINT"Abort (y/n)?";GOSUB130:PRINTCHR$(17);
3630 IF ASC(I$)=78 OR (ASC(I$)<>89) THEN 3460
3650 FOR Z=1TOLN:PRINTZ;": ";LEFT$(MG$(Z),MG(Z)):NEXT Z:GOTO3460
3660 PRINT"Enter line #":GOSUB130:IFCT=0THEN3460
3670 Z=VAL(I$):PRINTCHR$(17):IF Z<1 OR Z>LN THEN 3460
3680 CLS:PRINTCHR$(12);"Line currently reads: ":PRINT:PRINT LEFT$(
MG$(Z),MG(Z))
3690 IF C$="R" THENTL=0:PRINT"New line: ";GOSUB130:PRINTCHR$(17):
TL=-1:IF CT=0 THEN 3460 ELSE LSET MG$(Z)=I$:MG(Z)=CT:GOTO3460
3700 MG(Z)=0:GOTO3460

```

End

Program Listing 2. BBS module for reading and printing data-base files and messages.

```

350 E$=INKEY$:N=VAL(RIGHT$(F2$,4)):T$=T1$:TT$=F1$:S8$=S1$:S9$=CHR$(
ASC(S2$) AND 15):S7$=CHR$(ASC(S2$) AND 240):S6$=MID$("0123456789A
BCDE",ASC(S9$),1)
360 RD=-1:IF FN P(RN,MN$)<0 THEN RD=0
380 IFINSTR(SE$,S6$)=0THENRD=0
390 IF ((ASC(S7$) AND 32)=32) AND (LEFT$(T$,LEN(NA$))<>NA$) AND (L
EFT$(TT$,LEN(NA$))<>NA$) AND NOTSY THEN RD=0
400 IF (SF$="T" AND INSTR(T$,SS$)=0) OR (SF$="F" AND INSTR(TT$,SS$
)=0) OR (SF$="S" AND INSTR(S8$,SS$)=0) THEN RD=0
410 IF (D$="M") AND (ASC(S7$) AND 16)=16 THEN RD=0
415 IF E$=CHR$(3) THEN RN=E
420 RETURN
4720 GOSUB1230:IF PR THEN 5030
4730 PRINT"Message #";N;" SEC. ";S6$;" ";SS(ASC(S9$))
4740 L=INSTR(T1$," ");IF L=0 THEN L=LEN(T1$)
4750 PRINT"To: ";LEFT$(T1$,L);" ";
4760 IF (ASC(S7$) AND 16)=16 THEN PRINT"(X)";
4770 IF (ASC(S7$) AND 32)=32 THEN PRINT"(P)";
4780 PRINT
4790 L=INSTR(F1$," ");IF L=0 THEN L=LEN(F1$)
4800 PRINT"From: ";LEFT$(F1$,L)
4810 L=INSTR(S1$," ");IF L=0 THEN L=LEN(S1$)
4820 PRINT"Subject: ";LEFT$(S1$,L)
4830 PRINT"Date/Time: ";T2$:PRINTLEFT$(SS$,SV)
4840 IF SF THEN RETURN
4850 OPEN"O",3,F2$+"/BBS"+DD$
4860 GOSUB1230:IF PR THEN 5130
4870 POKE RE,SV
4880 IF EOF(3) THEN 5020
4890 IF INKEY$=CHR$(16) THEN 5020

```

Listing 2 continued

After the caller addresses the message and lists its subject, lines 3350-3380 ask the caller if the header is accurate. If so, the program prompts the caller to enter the message in the allotted space: 20 lines of 64 characters. The first line is indicated by 1:.

Lines 3400-3440 transfer the message from a GOSUB 130 (the telecommunicating Input statement) and LSETs I\$ (the characters received) into MG\$(LN), a temporary storage array. The program has previously dimensioned each of the elements here to 80 characters so you don't lose any additional string space.

Line 3420 checks for carriage returns (CHR\$(141)), removing them if the line isn't indented. Lines 3450-3700 deal with leave options. The GOSUB 860 in line 3540 inserts the message into the string MSG0000/BBS, constructing the secret file that we discussed last month. MN\$ is an in-memory index of all the messages on the board. Because each message number is represented by a 2-byte string in MN\$, it's easy to locate a message. We'll learn to manipulate MN\$ in a later column.

Reading and Printing

Program Listing 2 lets callers read messages on the board. We erroneously omitted lines 350-420 from last month's listings. These lines decode the information bit-mapped into S2\$. They also contain the file name and other fields of Messages/BBS, and decide if the caller is allowed to read the message.

Lines 4720-4830 put the header information on the screen, while lines 5030-5110 send this information to the line printer. If the scan flag (SF) in line 4840 is set to SF= -1, it prints only the headers, not the text. This gives you the option of reading or scanning the messages with a single routine.

Lines 4850-5020 are responsible for the text of both the messages and data-base files. Line 4850 opens the secret file on the data drive, while line 4870 POKES address RE with the video width, starting the reading process. The program tests for end-of-file in line 4880. Line 4890 checks for a control-P (CHR\$(16)), indicating that the caller has ceased reading. Line 5020 then brings you to Close and Return.

The exception to the video formatting routine is the .IMG extension. You don't want Basic programs with carriage returns in the middle of them, because the caller's Basic won't load them. The .IMG extension signals the program to forget about video formatting.

Line 4895 checks the UART status for loss-of-carrier if you're not operating from the console. If the caller hasn't hung up without first logging off, line 4900 invokes a LINE INPUT command that puts a string from disk into A\$. Line 4910 changes the CHR\$(141)s to carriage returns for printing. Line 4920 formats the string to the caller's screen width.

The exception to the video formatting routine is the .IMG extension. For example, you don't want Basic programs (XA files) with carriage returns in the middle of them, because the caller's Basic won't be able to load them; therefore, the .IMG extension on a file signals the program to forget about video formatting.

Finally, the program prints each

character in A\$, while it checks for control-P, XOFF (CHR\$(19)), XON (CHR\$(17)), and a loss of carrier.

Next month we'll be searching the message board, so watch for the BBS Express as it picks up steam. ■

The BBS Express, 80 Micro's bulletin board system, is open 24 hours a day. Call us at 603-924-6985 to see the finished product. UART parameters are 300 baud, seven bit words, one stop bit, and even parity.

You can reach J. Stewart Schneider and Charles E. Bowen either through their bulletin board at 606-739-6088 or c/o Saturday Software, P.O. Box 404, Catlettsburg, KY 41129.

Listing 2 continued

```
4895 IF ((INP(&HE8)AND32)=32) AND NOTWZ THEN 2630
4900 LINEINPUT#3,A$
4910 CR=INSTR(A$,CHR$(141)):IFCR>0 THEN MID$(A$,CR,1)=CHR$(13):GOT
04910
4920 IF INSTR(CM$,".IMG")=0 THEN Z=USR2(VARPTR(A$))
4930 FOR C=1 TO LEN(A$)
4940 PRINT MID$(A$,C,1);
4950 IF INKEY$=CHR$(16) THEN 5020
4960 IF INKEY$<>CHR$(19) THEN 5010
4970 IF INKEY$=CHR$(17) THEN 5010
4980 IF WZ THEN 4970
4990 IF (INP(&H0E8) AND 32)=0 THEN 4970
5000 GOTO2630
5010 NEXT:GOTO4880
5020 PRINT CHR$(17):CLOSE3:PRINT:RETURN
5030 LPRINT"Message #";N;" Sec. ";S6$;" ";S$(VAL(S6$)+1)
5040 LPRINT"To: ";T1$;
5050 IF (ASC(S7$) AND 16)=16 THEN LPRINT"(X)";
5060 IF (ASC(S7$) AND 32)=32 THEN LPRINT"(P)";
5070 LPRINT" "
5080 LPRINT"From: ";F1$
5090 LPRINT"Subject: ";S1$
5100 LPRINT"Date/Time: ";T2$:LPRINT LEFT$(S$,SV)
5110 IF SF THEN RETURN
5120 OPEN"I",3,F2$+"BBS"+DD$
5130 POKE VW,80:POKE RE,80
5140 IF EOF(3) THEN POKE VW,SV: GOTO 5020
5150 LINEINPUT#3,A$
5160 CR=INSTR(A$,CHR$(141)):IF CR>0 THEN MID$(A$,CR,1)=CHR$(13):GO
TO 5160
5170 Z=USR2(VARPTR(A$))
5180 LPRINT A$;:GOTO 5140
```

End



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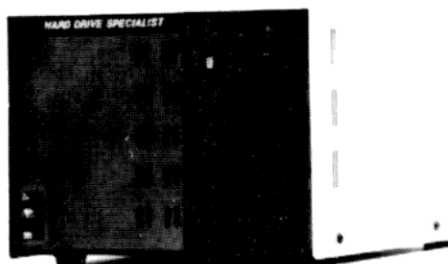
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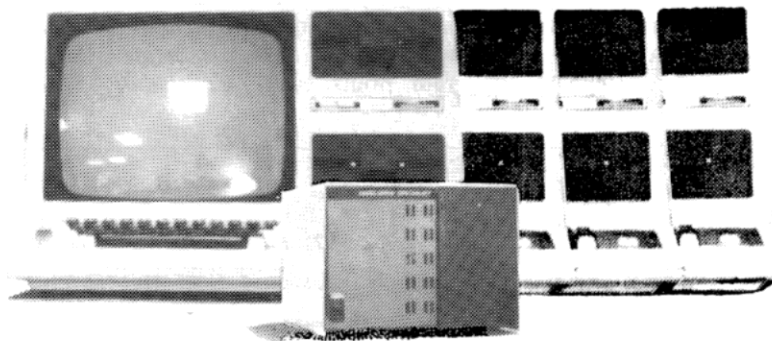
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Error Messages: Learning from Your Mistakes

You're keying in a 2,000-line program that the author says can mow your lawn. You type in a line, 4000 S=L, then type in RUN 4000 and press the enter key to check the line.

Deep in ROM an alarm goes off, interrupting a game of poker between OM and SN, two clerks in the Error Codes Bureau.

"What is it with the human," gripes SN. "Is he typing with his elbows?" SN takes the elevator up to the computer screen and flashes the message ?SN ERROR IN 4000. Before returning to the game, SN records the code number of the error and the number of the line where it happened, in case the human is interested.

Outside the computer, you scowl at the error message, then fix the line before continuing. You meant to type 4000 S=L.

You made a mistake, and the computer's error message helped you correct it. It told you the type of mistake you made and its location in the program. All you had to do was study the miscreated line for a moment and fix it.

The definitions of your computer's error codes appear in your owner's manual. This month I'll examine some common Basic error codes.

NF and SN Errors

An NF error means your program has a Next statement without a corresponding For statement. Type NEXT and press the enter key. The computer displays the message ?NF ERROR.

For...Next is a two-statement command that creates a program loop. The statements may be two lines apart or hundreds of lines apart. Here's an example:

```
100 FOR A=1 TO 10
110 PRINT A
120 NEXT A
130 END
```

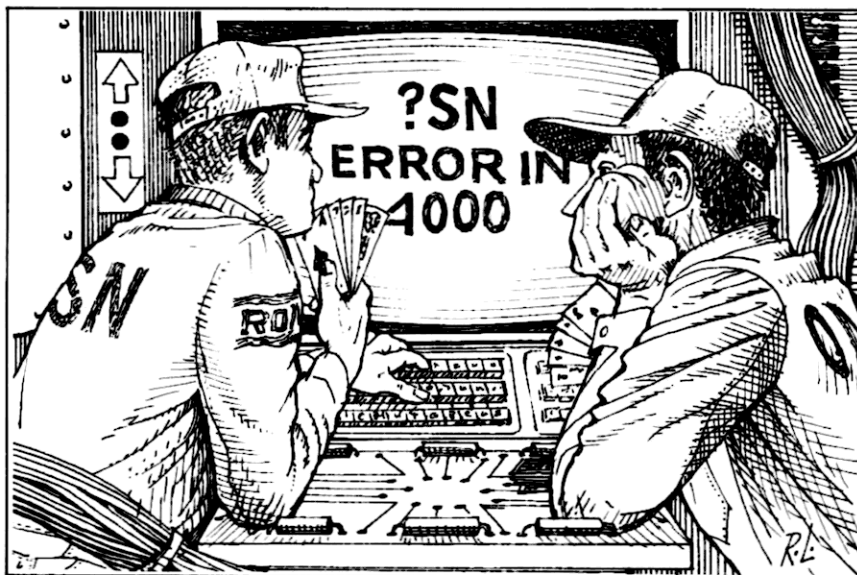


Illustration by Roy Lewando

Line 100 tells the computer to loop 10 times through line 120. Each time, variable A grows by one. Now delete line 100 and run the program. This time the message ?NF IN 120 appears. Here's a more complex example:

```
100 FOR X=1 TO 10
110 FOR Y=1 TO 3
120 PRINT X;Y
130 NEXT X;Y
140 END
```

The program generates an NF error after it prints the number 10. The Y For...Next loop must be "nested" within the X For...Next loop for the program to execute properly. The X and Y variables are in the wrong order in line 130.

If you include a For statement without a Next statement in your program, the program runs its course as though the For statement weren't there.

A syntax (SN) error commonly occurs when you're typing in a program listing. In Basic, correct syntax is the form in which statements must appear to be meaningful to the computer. The computer recognizes incorrect Basic syntax and returns an SN error.

Type in BARNACLE and hit the enter key. Any word that has no meaning in Basic results in a syntax error, including a misspelled Basic word.

Type A\$(1)="BASIC": PRINT LEN(A\$(1)) and hit the enter key. You expect the computer to return the number of characters in the string A\$(1). Because a parenthesis is missing, however, you'll get a syntax error. All commands and statements must have matched sets of parentheses.

This error becomes tougher to recognize in complex strings such as A\$=CHR\$(INT(SQR(1000))+ASC("M")-3). To prevent these errors I count the opening parentheses from left to right, then count the closing parentheses from right to left.

The line INPUT "ENTER A NUMBER",A contains a punctuation error. A semicolon should separate the input prompt from variable

The Key Box

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Basic

A, not a comma. The line `FOR$ = "CHECKING"` results in a syntax error because it uses the Basic reserved word `For` as a string variable.

Other examples of this type of error include `TOME$` (contains the reserved word `TO`), `AUTOMOBILE$` (contains `AUTO` and `TO`), and `WITH-OUT` (contains `OUT`).

No string or number variable can include Basic reserved words. A list of reserved words appears in your manual.

RG, OD, and FC Errors

`RG` stands for Return without `GOSUB`. Type in and run the following listing:

```
100 FOR X=1 TO 3
110 GOSUB 1000
120 NEXT X
1000 PRINT X
1010 RETURN
```

This program loops three times through lines 100-120. From line 110, control goes to line 1000, where the program prints the value of `X`. Line 1010 then returns the program to the loop in lines 110-120.

The program runs correctly in the loop, but falls through to line 1010 without reading a `GOSUB`. It prints the value of `X` again, then finds a Return without a previous `GOSUB`. One solution is to add a line 130 with an End statement.

An `RG` error also occurs if you type in `GOTO` when you meant to type in a `GOSUB`.

An `?OD ERROR` on your screen is an out-of-data error. The computer assigns values stored in data statements in the program or on tape or disk. It signals an `OD` error if the program tells it to look for data that doesn't exist.

Type in the following program:

```
100 REM * DATA LIST
110 CLS
120 DATA 1,2,3,4,5
130 DIM A(6)
140 FOR X=1 TO 6
150 READ B(X)
160 NEXT X
170 END
```

An `OD` error occurs in line 150 when the program tries to read in a sixth value. Only five items appear in the data statement in line 120, yet the program dimensions a six-value array and starts a loop to read in six values.

`FC` is an illegal function call. This

*An OM error means
out of memory.
This happens when
you type in a program
that's too long
for your system
to store in RAM.*

error occurs when the program tells the computer to do something outside the range of its capability. Look at the following statements:

```
100 A=SQR(-1)
120 B=LOG(0)
130 PRINT A$(-1)
```

It is impossible to square a negative or get a Log of zero, so an `FC` error occurs in lines 100 and 110. An `FC` error results in line 130 because you can't have a negative array.

Values change during the run of a program through random number generators and user input. For this reason a program line can work during one run and result in an `FC` error in the next.

Try running the following listing:

```
100 REM * FC ERROR
110 CLS
120 X=38
130 PRINT @X,"Z ";
140 X=X-1
150 GOTO 130
```

When you run this program, a `Z` races from right to left on the screen and an `FC` error occurs in line 130. The program tells the computer to print at a nonexistent screen position.

The Models I, III, and 4 can't print at screen positions higher than 1023. The Model 100 can print up to position 319. This program quickly goes below the first position.

OV, OM, UL, and BS Errors

The `OV`, or overflow, error occurs when a number is too big or too small for the computer to handle. Running the statement `PRINT 100A100` results in an `OV` error. To see how big or how small a number your computer can handle, type in and run the following program:

```
100 REM * OV ERROR
110 CLEAR 500
120 A$="10"
130 A=VAL(A$)
140 PRINT LEN(A$)-1;"A"
150 A$=A$+"0"
160 GOTO 130
170 END
```

This program generates an `OV` error. The figure to the screen left is the number of zeros in the number when the error occurs. To find the negative limits, change line 120 to `A$ = "-10"` and run the program.

An `OM` error means out of memory. This happens when you type in a program that's too long for your system to store in RAM. Your computer requires a certain amount of memory overhead to run programs, so the last bit of memory runs out when you run a program.

In such a case, the `OM` error occurs on the line where memory runs out. The computer displays the amount of free memory when you type `PRINT FRE(0)` and hit the enter key.

Short programs can produce `OM` errors. For example, `100 CLEAR 100000` tells the computer to clear 100,000 bytes to store strings. Since your system has under 100K of RAM available, an `OM` error results.

In `DIM A(1000000)` the computer attempts to dimension an array that holds one million pieces of data. Again, the computer lacks enough memory and returns an `OM` error.

In rare cases, complex nested branches involving `GOTO`, `GOSUB`, and `For...Next` loops can yield `OM` errors. If an `OM` error message flashes for no apparent reason, one of these situations might be the problem.

A `UL` error is an undefined line. Type in `NEW`, hit the enter key, then type in `GOTO 1000`. The computer displays a `UL` error message because no line 1000 exists. The same can happen when a program runs. The `GOTO` and `GOSUB` commands must have objective lines.

`BS` is a bad subscript range. This happens when you attempt to assign a value to an array variable that's beyond the range you set. Here's an example:

```
100 REM * BS ERROR
110 DIM A(3)
120 A(4)=6
130 END
```


DD, /0, ID, and TM Errors

A DD error, or redimensioned array, results when you try to redimension an array in a program. For example:

```
100 REM * DD ERROR
110 DIM A(3)
120 DIM A(4)
130 END
```

Line 120 produces the DD error. This happens whether the DIM statements are two lines or 200 lines apart. To avoid this problem, it's good practice to put all DIM statements at the beginning of your programs.

/0 is a division by zero error. You probably know that you can't divide by zero, but a variable may reach a zero value through random number generators or user input.

ID stands for illegal direct. Type INPUT="FRED" and press the enter key. An ID error occurs because the input form is wrong.

TM is a type mismatch error. You can't assign a string to a numerical value (A\$=5), nor can you assign a nu-

*You probably know
that you can't divide
by zero, but a
variable may reach
a zero value
through random
number generators.*

meric variable to string characters, as in A="Sam".

The statement A="Sam" is correct, however, if the program contains a DEFSTR A statement in a previous line (this defines A as a string). This technique lets you write A instead of A\$, but can lead to confusing errors.

If the program defines A as a string, any variable starting with A is a string.

OS, LS, ST, CN, And MO Errors

An OS, or out-of-string error, results when the computer runs out of string storage space. Turn off your computer, then turn it on and type in PRINT FRE(""). The computer displays the maximum number of characters that it can store.

To increase string storage capacity, include a CLEAR statement for the amount of string space you need. Typing CLEAR 500 gives you 500 bytes of string space, enough for roughly 500 characters.

Clearing string space uses memory, but you must clear enough bytes to store all string values used in your program. Here is an example program:

```
100 REM * OS ERROR
110 CLEAR 500
120 FOR X=0 TO 10
130 A$(X)=STRING$(255,65)
140 PRINT A$(X)
150 NEXT
160 END
```

This program is supposed to print the letter A (the ASCII value of 65) 255 times in line 140, then loop back and print the line 10 more times. Since the program clears 500 bytes and requires 25,500 bytes of string space, an OS error results.

An LS (long string) error occurs when a string variable is longer than 255 characters. See if you can find

where this listing creates an LS error:

```
100 REM * LS ERROR
110 CLS
120 CLEAR 1000
130 FOR X=1 TO 1000
140 A$=A$+"X"
150 PRINT X "-"A$
160 NEXT
170 END
```

This error can also occur if you add (concatenate) two or more strings whose total length exceeds 255 characters.

An ST error results when a string formula is too complex. This is uncommon, however. If you get an ST error, it will likely point you to a line containing an excessively long string manipulation.

Although the string may be syntactically correct, the manipulation is too long for the computer to handle. When this happens, break up the work into several lines.

A CN error means the program can't continue. Type in NEW, press the enter key, then type in CONT (for continue). A CN error results because you don't have a program running.

This error also happens when you break into a running program, edit a line, and attempt to continue. The solution is usually to run the program again.

MO stands for missing operand. This error occurs when you have left something out of a mathematical statement. The following statements all produce MO errors:

```
100 FOR X=1 TO
110 X=
120 PRINT 2*
130 PRINT 4/
```

These are some of the more common error messages that you will encounter when programming in Basic. Others include error messages pertaining to disk systems, or deal with error recovery routines that you can build into your programs.

Preventing errors goes beyond simple recognition. It involves programming in error-trapping routines (which themselves create beneficial errors), and using programming techniques that eliminate anticipated errors.

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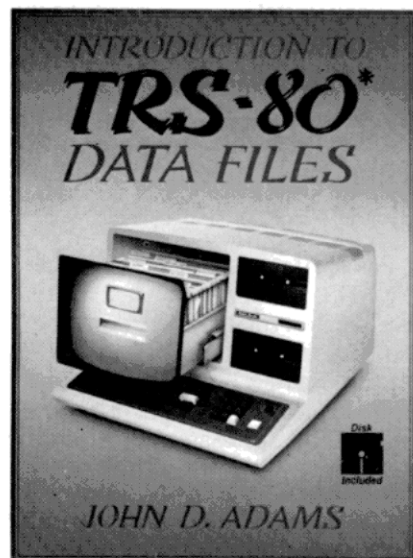
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Pascal's Input And Output Files

So far, the programs I've covered have read data from the keyboard only and written it to the computer screen only. Pascal wouldn't be a very useful language if that were all it could do. In fact, Pascal's (especially Alcor Pascal's) input/output (I/O) capabilities are much more versatile than Basic's.

The Ins and Outs of Pascal

A Pascal program normally reads its input from a standard file named Input and writes to a standard file named Output. When you run a compiled program, you must answer the prompts:

```
INPUT =
OUTPUT =
```

with the names of the files you want used as the standard files. If you press the enter key without typing in a file name, the program uses the default values, the keyboard and screen.

You could, instead, type in the name of a file stored on disk for the input file and a legal file name for the output file. For example, if you type in SOURCE.TXT for the input file and OUTPUT.TXT for the output file, then every time the program executes a Read or READLN statement, the data comes from the file named Source.TXT; likewise, any output from Write or WRITELN statements goes to the file named Output.TXT.

Program Listing 1 shows how this works. The program reads strings from the input file and writes them to the output file. Compile the program and run it; for input, type in the name of an ASCII text file on disk (with character data only, no special codes). For output, type in another valid TRSDOS file name.

The program copies the input file to the output file. EOF is a Pascal function that returns a Boolean value; true

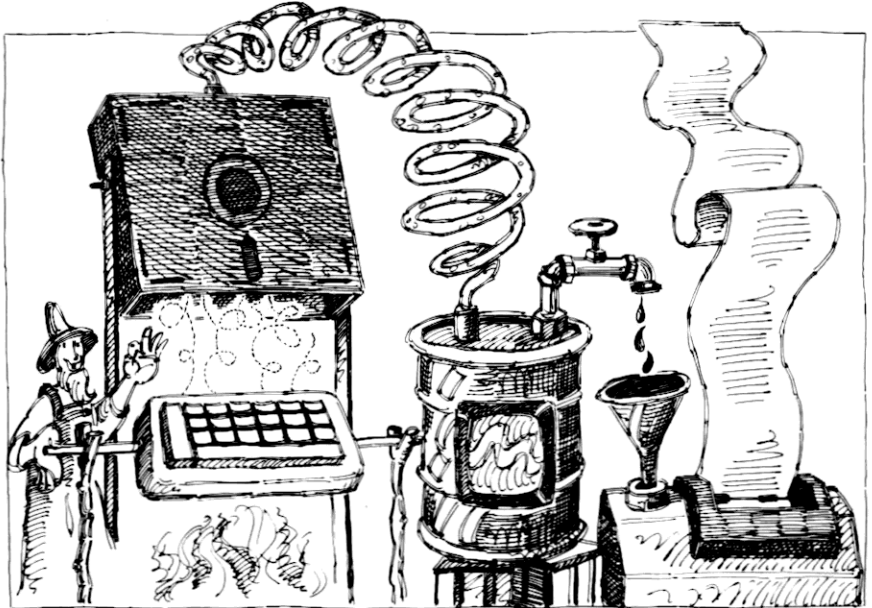


Illustration by Peter Bono

if the program has read the last byte of the file, false if not. The While loop executes until the program reads all the strings in the input file and writes them to the output file.

In programs that don't use the standard I/O procedures (read, READLN, write, and WRITELN), you might not want the prompt for input and output file names. To leave the standard files undeclared, begin your program with the compiler option {\$NO INOUT} or (*\$NO INOUT*). You can't use the standard I/O statements with this compiler option unless the program itself opens files—I'll discuss how to do that later in this column.

You can use the message procedure to send output to the screen regardless of the standard output file, as in this sample program:

```
($NO INOUT)
program test;
begin
  message('This goes to the screen.');
```

```
end.
```

Name That File

You'll often need files other than the standard input and output files. Then you use a file identifier in your program to refer to the file; the identifier shouldn't have the same name as the name of the file on disk. You must declare the file identifier as you would any other variable. For example:

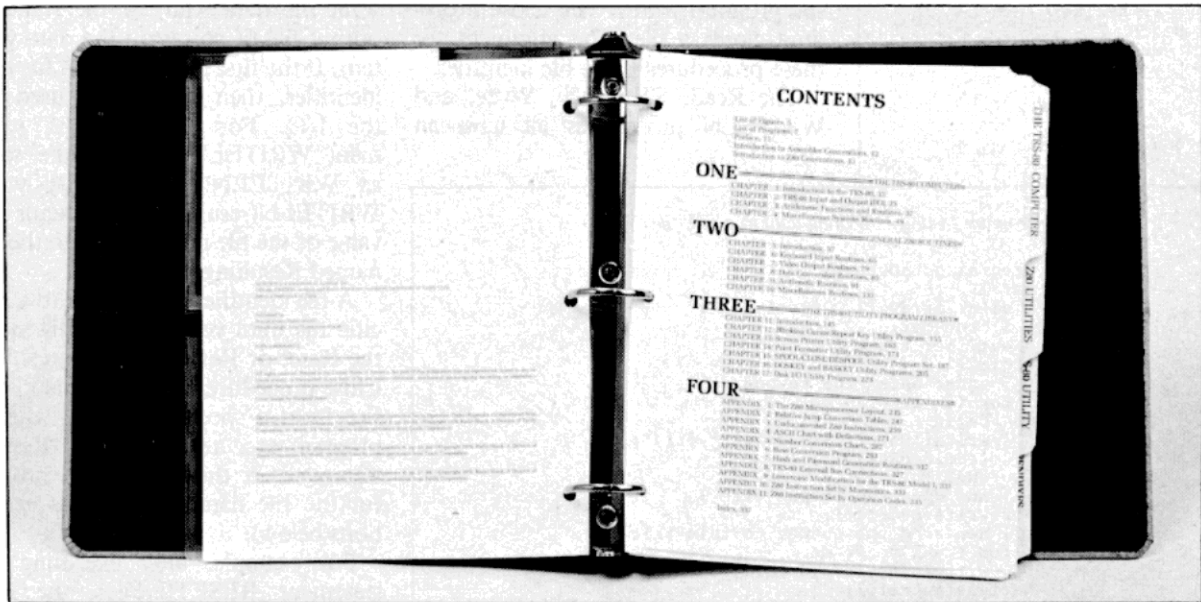
```
var
  outFile: file of char;
  outFile2: file of integer;
```

Pascal has a special file type called text. The standard input and output files are text files. When declaring a text file, you don't have to type in FILE OF TEXT, because the type is predefined. To declare a text file called inFile, for example, you simply type in:

```
var
  inFile: text;
```

Although a file identifier refers to only one disk file at a time, over the course of a program's execution it

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Program Listing 1. Simple input and output program.

```

program copyASCIIFile;
var
  a: string;
begin
  while not eof(INPUT) do
  begin
    readln(a);
    writeln(a);
  end;
end.

```

End

might refer to several different disk files.

The Reset procedure opens files from which the program reads; the Rewrite procedure opens files to which the program writes. The Close procedure closes a file. The argument for these procedures is the file identifier.

The Read, READLN, Write, and WRITELN procedures all have an

optional file parameter that appears before any data you want written or variables you want read. If the first parameter isn't a file type, the default value is the standard input file (if you want the data read) or the standard output file (if you want the data written). If the first parameter is a file type identifier, then that file is used for the I/O. For example: the statement WRITELN(data); is the same as WRITELN(output,data); while WRITELN(resulting,data); sends the value of the file named Data to the file named Resulting.

A file identifier isn't bound to a specific file until you open the file using the Reset or Rewrite procedures. The Close procedure detaches a file identifier from a specific file. So, when a program executes a Reset or Rewrite statement, it then pauses to prompt for the file name (I'll discuss exceptions below).

For example, after executing the statement RESET(inFile), the program prompts you for a new value for inFile. If you press the enter key without typing in a file name, the program uses the default input or output file. If you type in the file name Example/DAT, the program refers to the disk file Example/DAT every time it encounters the identifier inFile. Program Listing 2 illustrates these points.

Program Listing 2. Writing data to a disk file.

```

program dataOutput;
var
  data: array [1..20] of real;
  i: integer;
  outFile: text;
begin
  { enter data from keyboard }
  for i:= 1 to 20 do
  begin
    write('Enter data point ',i:1,' ');
    readln(data[i]);
  end;
  { now open the output file }
  rewrite(outFile);
  { now send the output to this file }
  for i:= 1 to 20 do
    writeln(outFile,data[i]:10:5);
  close(outFile);
end.

```

End

Program Listing 3. Using the SETACNM procedure.

```

program dataOutput;
var
  data: array [1..20] of real;
  i: integer;
  outFile: text;
procedure setAcnm(var fileID: text; name: string);
external;
begin { program body }
  { enter data from keyboard }
  for i:= 1 to 20 do
  begin
    write('Enter data point ',i:1,' ');
    readln(data[i]);
  end;
  { now open the output file }
  setAcnm(outFile, bldstr('object/txt'));
  rewrite(outFile);
  { now send the output to the file OBJECT/TEXT }
  for i:= 1 to 20 do
    writeln(outFile,data[i]:10:5);
  close(outFile);
end.

```

End

Program Listing 4. Printing a binary file as a text file.

```

program realInTextOut;
var
  realFile: file of real;
  printer: text;
  value: real;
procedure setAcnm(var p: text; s: string); external;
begin
  { open file to read }
  write('Enter the name of the FILE OF REAL to read: ');
  reset(realFile);
  { open printer for output }
  setAcnm(printer,bldstr('L'));
  rewrite(printer);
  { now copy values from the file of reals to the printer }
  while not eof(readFile) do
  begin
    read(readFile,value);
    writeln(printer,value:10:6);
  end;
end.

```

End

The Tie That Binds

Sometimes it isn't convenient to have the program stop and prompt you for a file name. Alcor Pascal provides a way of linking a file name to a file identifier from within the program: the SETACNM procedure. To use this procedure, you must declare it as an external procedure before the main body of the program begins. The declaration looks like this:

```

procedure setAcnm(var a: <fileType>;b: string);
external;

```

You more advanced Pascalers might see a problem in using the SETACNM procedure to bind file names to file identifiers of different types: Pascal's strong file typing. If the first parameter of the SETACNM procedure is a text file, and you want to use an integer-type file, the program reports an error, since the types of the formal parameter and the procedure invocation don't match.

There's a way around this problem.

A file identifier isn't bound to a specific file until you open the file using the Reset or Rewrite procedures.

Alcor Pascal thoughtfully provides a type transfer operator that lets you bypass Pascal's type checking. The operator's symbol is two colons (::). Use this operator with caution. If the sizes of the two types aren't identical, nasty things can occur, like overwriting other variables or part of your program.

However, since Alcor Pascal's file buffers are all the same size, you can safely transfer file types in this case. The syntax for a type transfer is <variable>::<>expected type>. For example, if inFile is a real-type file and the SETACNM procedure calls for the first parameter to be a text file, then the statement:

```
setAcnm(inFile, name);
```

generates an error because the first parameter isn't the correct file type. However, you can use:

```
setAcnm(inFile::text, name);
```

to temporarily give inFile a new file type, text. The procedure binds the value of the file called Name to the file identifier inFile. If Name is a string file and has the value Source/TXT, then the file identifier inFile refers to the disk file Source.TXT.

Program Listing 3 is a modification of Listing 2; it eliminates prompts for file names after the Rewrite procedure. The second parameter of the SETACNM procedure must be a string-type variable, because a string constant has an implied type of packed array of character. The predefined Alcor Pascal procedure BLDSTR lets you create a string type from a string constant.

Binary Files

Input and output with text files change the internal storage format of Pascal's simple data types to ASCII characters. For example, Pascal stores a real-type value in memory in binary floating-point form, but when a pro-

Program Listing 5. Storing customer records as binary files.

```
program cIO;
type
  cRec = record
    name: packed array [1..20] of char;
    age: 0..99;
    address: packed array [1..40] of char;
    amountDue: real;
  end;

  cRecFile = file of cRec;

  cList = array [1..20] of cRec;
  cmdType = (quit, keyIn, readIn, writeOut, display);
  choiceType = record
    case boolean of
      true: (num: 0..4);
      false: (cmd: cmdType);
    end;
  end;

var
  custList: cList;
  customer: cRec;
  cFile: cRecFile;
  numberOfRecords: integer;
  option: choiceType;

function getKey: char; external; { Alcor library function }
procedure inputCustomer (var customer: cRec);
begin
  write('Enter customer name: ');
  readln(customer.name);
  write('Enter customer address: ');
  readln(customer.address);
  write('Enter customer age: ');
  readln(customer.age);
  write('Enter customer amount due: ');
  readln(customer.amountDue);
end;

{ displays a list of the customers to the specified device }
procedure dispList(var custList: cList; numberOfRecords: integer);
var
  outFile: text;
  i: integer;
  pauseYN: boolean;

  procedure pause;
  var c: char;
  begin
    c:= getKey;
  end;

  procedure writeCustomer (var out:text; var customer: cRec);
  begin
    with customer do
      begin
        writeln(out, 'Name: ', name);
        writeln(out, 'Address: ', address);
        writeln(out, 'Age: ', age);
        writeln(out, 'Amount due: ', amountDue:6:2);
      end; { with }
    end;
  end;

begin { dispList }
  write('Pause after each record (TRUE/FALSE)? ');
  readln(pauseYN);
  write('Enter name of output file for display ');
  rewrite(outFile);
  writeln(outFile, 'There are ', numberOfRecords, ' customers in the list. ');
  for i:= 1 to numberOfRecords do
    begin
      writeCustomer(outFile, custList[i]);
      if pauseYN then pause;
    end;
  close(outFile);
end;

{ returns the number of record written }
function readCFile(var list: cList): integer;
var
  cFile: cRecFile;
  i: integer;
begin
  reset(cFile);
  i:= 1;
  while not eof(cFile) do
    begin
      read(cFile, list[i]);
      i:= i + 1;
    end;
  close(cFile);
  readCFile:= i - 1;
end;

procedure writeCFile(var list: cList; numberOfRecords: integer);
var
```

Listing 5 continued

gram writes that value to a text file, it uses character digits and letters.

However, some files are in binary format. An integer file, for example, outputs integer values to a file in the same format you store them in. So binary files require much less storage space than text files. Generally, only a program manipulates binary files; if you need to see file contents, the program reads the binary format and writes it out in text format.

You can use the Read and Write procedures with binary files, but not READLN or WRITELN; to read a line or write a line makes sense only in reference to text files. Program Listing 4 reads a real-type file and sends it out to the printer.

You indicate output to the printer by typing in :L, the standard file name for the parallel line printer device.

In a text file, you use spaces as delimiters to separate numerical values. A carriage return terminates a string. When a program reads a character-type variable from a text file, it returns the next character. In a packed array

of character, the size of the array determines the number of characters the program reads.

In a binary file, all the elements are of the same type. This is useful when you're dealing with files of structured data types. Suppose you want to store information on a large number of customers, including name, age, address, telephone number, and so on. You can construct a record type to hold this information and then declare a file of that record type.

When the file is of a structured type, the Read and Write statements can perform I/O on the entire record, not just one of the fields, as is the case with a text file type. Program Listing 5 reads customer information from the keyboard and writes it to a structured binary file. The program uses a number of features, including variant records, introduced in earlier columns.

When you run this program, the main program calls the function menu. You input a number from zero to 4 to determine the command option. Notice that the menu function returns an integer subrange and the program assigns this value to a variant record with the statement:

```
option.cmd := menu;
```

You can type in your customer records one at a time with the keyboard entry option. The read and write options read or write the records to a binary disk file. The display option prints the records to the specified output file; pressing the enter key sends the output to the screen. The program includes an option that pauses the program after every record until you press a key—this procedure uses the Alcor Library function GETKEY.

By the way, a bug in the Alcor Pascal compiler can cause the program to fail if you change the types of the name and address fields from packed array of character to string file. When you're using binary files, packed arrays of character work and strings don't. If you must use variable-length character strings (string-type variables or fields), go with text files.

You can use only sequential files in Standard Pascal; you have to access file data in the order of storage. Alcor Pascal does have a set of procedures for creating random access files, but that's a column all by itself. ■

*You can write to Bruce Powel
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Listing 5 continued

```
cFile: cRecFile;
i: integer;
begin
  rewrite(cFile);
  for i:= 1 to numberOfRecords do
  begin
    write(cFile, list[i]);
  end;
  close(cFile);
end;
function menu: cmdType;
var
  option: choiceType;
begin
  writeln('Enter choice number: ');
  writeln('1. Keyboard Entry of customer record');
  writeln('2. Read customer list from disk');
  writeln('3. Write customer list to disk');
  writeln('4. Display customer list');
  writeln('0. Quit program');
  writeln('There are currently ', numberOfRecords, ' customers. ');
  readln(option);
  menu:= option.cmd;
end;
begin { main program }
  numberOfRecords:= 0;
  repeat
    option.cmd:= menu;
    case option.cmd of
      keyIn: begin
        numberOfRecords:= numberOfRecords + 1;
        inputCustomer(custList[numberOfRecords]);
      end;
      readIn: numberOfRecords:= readCFile(custList);
      writeOut: writeCFile(custList, numberOfRecords);
      display: dispList(custList, numberOfRecords);
    end; { case }
  until option.cmd = quit;
end.
```

End

Tidbit #13

Here's a simple programming trick that enhances the appearance of printouts from your Basic programs. It lets you create new characters with your current character set. You do so by printing out a standard character, backspacing, and printing another character over the first to get a unique third character. For example, if you print the letter o, backspace, then print a slash over it, you get the Greek letter phi, Φ .

Use LPRINT commands to print out the characters; the backspace code you use depends on the printer you own. A Radio Shack DWP-210 needs CHR\$(8); CHR\$(n), where n equals the number of backspaces you want.

The Table shows only a few of

the possibilities. You can experiment with n and other available characters to construct useful and interesting new symbols. Use a dictionary that lists symbols and signs as a source of new characters to create.

You may find control codes useful as well. For example, you can fractionally line-feed the DWP-210 from Basic. This technique lets you produce the familiar $\&$ sign that druggists often use:

```
LPRINT "R";CHR$(8);CHR$(6);CHR$(27);CHR$(28);"X"
```

If you're using a Model I, remember to press the shift key for lowercase characters in Basic.

*C.P. Hoult
Los Angeles, CA*

New Symbol Name	First Character	Second Character
Greek theta	o	-
Greek phi	o	/
Greek epsilon	C	-
Yen sign	Y	=
Cents sign	c	/
Not-equal sign	=	/
Implies sign (right arrow)	= = or - -	>
Sign for planet Pluto	P	L
Partial derivative sign	3	o

Table. Sample characters.

Tidbit #14

I've found that the easiest way to use the 4 MHz Model 4 clock in the Model III mode is with two one-line subroutines: one for speeding up, and the other for slowing down.

To speed up the clock to 4 MHz for data entry and manipulation, use this subroutine:

```
XXXX POKE 16912,104 : OUT 236,104 : RETURN
```

Be sure to slow down the clock to 2 MHz before Open, I/O, or PEEK statements. Use this subroutine:

```
XXXX POKE 16912,40 : OUT 236,40 : RETURN
```

I used a zero to 20,000 For... Next loop for a benchmark routine. The routine takes 51 seconds to run in Model III mode, and 30 seconds in Model 4 mode. The actual time saved changes with the specific execution instructions.

Caution—The clock also runs faster in the speed-up mode. If you use the clock for specific tasks, use an add-on calendar and clock board.

*Edward E. Umlor
East Fitzwilliam, NH*

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Put Your Model 4 Function Keys to Work

The Model 4 has three function keys (F1, F2, and F3) that generally sit unused above the numeric keypad. To use those keys, you have to write a keyboard filter to change their values. This month and next, I'll show you how to write and install such a filter.

Two short digressions before digging into this month's program. First, I wrote the source code using the EDAS assembler. You can use any Model III or Model 4 assembler. To do so, you might have to leave the @ sign off the labels, slightly change the method of defining messages, and expand the macro instruction (see my September column, p. 144). But once you compile the source code into Z80 machine language, your computer doesn't care which assembler you use.

Second, I'd like to give credit to two excellent books that helped me write this and next month's programs. The first is Radio Shack's *Model 4 Technical Reference Manual* and the second is Roy Soltoff's *The Programmer's Guide to LDOS/TRSDOS Version 6* (Misosys, P.O. Box 4848, Alexandria, VA 22303). I've drawn heavily from both these books and recommend them.

Understanding the Filter

To understand this month's program, Three Keys (see the Program Listing), read the comments at the beginning of the Listing. Then look at line 1490, where the filter module begins. The actual filter is relatively short—only 69 bytes including the memory header. Everything in between is the code that links the filter to the system and relocates the filter module to the top of available memory.

Lines 1470–1520 are a standard TRSDOS 6.X memory header required for every program and data area in protected high memory. The first 2 bytes must invoke a relative jump to the beginning of the actual

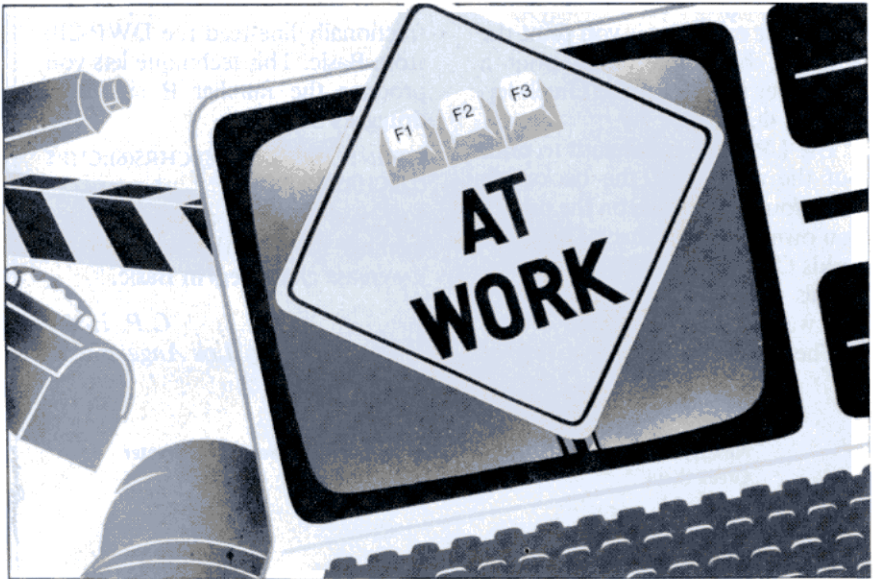


Illustration by John Pirman

program. The next 2 bytes must contain the address of HIGH\$ before you install the program in high memory (that is, the address of the last byte of this program).

Then use a single byte to define the length of the module name, followed by the name itself. The name doesn't have to be the same as the program's file name on disk; for example, the TRSDOS communications driver, COM, has a header name of CL\$.

Four bytes follow the module name. The first two must contain the address of the filter's device control block (DCB) and the last two are reserved for future system use. An optional data area follows those bytes. Three Keys stores the default values of the function keys in the data area; if you want a standard set of values each time you install this module, store your own values here. Otherwise, use next month's program to change those values from TRSDOS Ready.

The next 50 bytes actually filter the keyboard characters. Every time the system or a program calls a filter or driver module, it sets the Zero and

Carry flags to indicate what type of request you're making. When the computer sets the Carry flag in the F register, the calling program is requesting a byte of data from a particular device. Technically, this is called an @GET request. When the Carry flag isn't set but the Zero flag is, the program is sending a byte of data to the device (@PUT request). If neither flag is set, the calling program is sending a control code to the device (@CTL request).

Obviously, sending data to the keyboard makes no sense, but you can send a control code to the keyboard driver (a control code of 03 tells the keyboard driver to clear the type-ahead buffer, for example). There-

The Key Box



Model 4
64K RAM
Assembly Language
EDAS

fore, the filter must begin by determining what type of request you've made.

If the Carry flag isn't set, this must be an @PUT or @CTL request. Three Keys isn't designed to handle either, so it sends them down the chain of filters and drivers to which it is attached by loading the IX register with the value stored in the memory header at MODDCB, and then invoking the @CHNIO Supervisory Call (SVC). A filter doesn't need to know how it's connected to the rest of the system; the @CHNIO call, coupled with the internal organization of TRSDOS, takes care of that. This filter must return whatever flags and values the @PUT or @CTL requests generate further down the chain. It does so with a simple Return command after the @CHNIO SVC.

The Filter at Work

When the filter receives an @GET request, it starts to work. Since the filter doesn't read the keyboard directly (this would cause massive hardware and software confusion), it uses the @CHNIO SVC to send the @GET request down the input chain (starting in line 1680). If the result is returned with the Zero flag reset, either an error occurred farther down the chain or no data is available for return. In either case, the filter returns control to the calling program to handle the problem. However, if the Zero flag is set, the filter can get to work, and passes control to line 1840.

The filter can't know whether you've pressed a function key. All it can determine from the value in the A register is whether the input chain has returned the code for such a key. The keyboard driver returns the hexadecimal (hex) values 81, 82, and 83 for the unshifted function keys, and 91, 92, and 93 for shifted function keys. The section of code in lines 1820-1890 tests for those values and passes control to line 1970 if it finds any one of them. If it finds none, it sets the Zero flag (to show that it has received data) and returns control to the calling program (lines 1900-1910).

If the program finds a function key value, it changes it to a value from zero through five (beginning in line 1970), and then looks up the appropriate new value in the data table at the

The filter can't know whether you've pressed a function key. All it can determine is whether the input chain has returned the code for such a key.

beginning of the filter module. It puts the new value in the A register (where the calling program expects it), sets the Zero flag, and passes control back to the calling program.

This short filter module demonstrates two of TRSDOS's important conventions. First, a return from almost any SVC with the Zero flag reset

is an indication of an error or lack of data. The filter ducks those problems by returning the error status to the calling program. On the other hand, a set Zero flag indicates success.

Second, the computer puts any values it receives from an @GET request into the A register. Conversely, it puts any values passed from a program to a

Program Listing. Three Keys.

```

00100 ; *****
00110 ; *      Function Key Filter      *
00120 ; *                               *
00130 ; *   Written by Hardin Brothers   *
00140 ; *                               *
00150 ; *****
00160 ; Assemble as FKEY/FLT
00170 ;
00180 ; This filter must be invoked with the SET command
00190 ; from TRSDOS 6.x and then connected to the
00200 ; keyboard input chain with the FILTER command.
00210 ;
00220 ; A normal invocation sequence would be
00230 ;
00240 ; SET *FK [TO] FKEYS/FLT
00250 ; FILTER *KI [USING] *FK
00260 ; Then set FKEY values using SETFKEYS/CMD
00270 ; (see next month's program)
00280 ;
00290 ;
00300 ; *****
00310 ; Equates:
00320 ; *****
00330 LF EQU 10 ;Line feed
00340 CR EQU 13 ;Carriage return
00350 ;
00360 ; SVCs:
00370 @DSPLY EQU 10 ;Display a message line
00380 @CHNIO EQU 20 ;Pass control down device chain
00390 @EXIT EQU 22 ;Exit to TRSDOS Ready
00400 @HIGH$ EQU 100 ;Find or set HIGH$
00410 @FLAGS EQU 101 ;Point IY to system Flag Table
00420 ;
00430 ; *****
00440 ; Macro Instruction:
00450 ; *****
00460 SVC MACRO #NUMBER
00470 LD A,#NUMBER ;Load A with SVC number
00480 RST 28H ;Execute SVC
00490 ENDM
00500 ;
00510 ; *****
00520 ; Initialization Routine
00530 ; *****
00540 ;
00550 ORG 3000H
00560 BEGIN PUSH DE ;Save DCB pntr on stack
00570 LD (MODDCB),DE ;And stuff into filter
00580 PUSH HL ;Save command pointer
00590 LD HL,SGNON ;HL==>Sign-on message
00600 SVC @DSPLY ;Display on screen
00610 POP HL ;Recover pointer
00620 ; *****
00630 ; Check if we got here from SET
00640 ; *****
00650 SVC @FLAGS ;Point IY to AFLAGS
00660 BIT 3,(IY+'C'-'A') ;Test bit 3 of CFLAG$
00670 JR NZ,SETHI ;Go if SET used, else
00680 LD HL,SETMSG ;HL==> 'Use SET' message
00690 SVC @DSPLY ;Show message
00700 LD HL,-1 ;Show extended error
00710 SVC @EXIT ;Back to TRSDOS
00720 ; *****
00730 ; Reset HIGH$ and prepare to relocate filter
00740 ; *****
00750 SETHI LD HL,0 ;Select HIGH$
00760 LD B,L ;B=0 => get current value
00770 SVC @HIGH$

```

Listing continued

Listing continued

```

3029 224731 00780 LD (OLDHI),HL ;Save in filter header
302C 280A 00790 JR Z,RELOC ;Go if no error
;
302E 21C630 00810 LD HL,NOMEM ;HL=> Error message
3031 00820 SVC @DSPLY ;Print it
3034 21FFFF 00830 LD HL,-1 ;Signal extended error
3037 C9 00840 RET ;Back to TRSDOS
;
;*****
;00850 ; Move filter to high memory and protect
;00860 ;
;00870 ;*****
3038 FD218A31 00880 RELOC LD IY,RELTAB ;IY=>List of abs. addr.
303C 118931 00890 LD DE,FLTEND ;DE=curr. end of filter
303F AF 00900 XOR A ;Clear carry flag
3040 ED52 00910 SBC HL,DE ;Calculate dist. to move
3042 E5 00920 PUSH HL ;Transfer to
3043 C1 00930 POP BC ; BC register pair
3044 FD6E00 00940 RELOC1 LD L,(IY+0) ;Get address to change
3047 FD6601 00950 LD H,(IY+1) ; in HL
304A 7C 00960 LD A,H ;Test for 0
304B B5 00970 OR L ; (end of list)
304C 280F 00980 JR Z,MOVE ;Move module when done
304E 5E 00990 LD E,(HL) ;Move contents of address
304F 23 01000 INC HL ; to change in
3050 56 01010 LD D,(HL) ; DE register
3051 EB 01020 EX DE,HL ;HL has value to change
3052 09 01030 ADD HL,BC ;Offset value
3053 EB 01040 EX DE,HL ;DE has new value
3054 72 01050 LD (HL),D ;Put it back in place
3055 2B 01060 DEC HL ; so new value
3056 73 01070 LD (HL),E ; will be correct
3057 FD23 01080 INC IY ;Bump IY to next
3059 FD23 01090 INC IY ; entry in table
305B 18E7 01100 JR RELOC1 ;Loop back until done
;
;01110 ;*****
;01120 ; Now move module into high memory
;01130 ; and readjust HIGH$
;01140 ;*****
305D ED5B4731 01150 MOVE LD DE,(OLDHI) ;DE=>Destination address
3061 218931 01160 LD HL,FLTEND ;HL=>Current end of mod
3064 014500 01170 LD BC,FLTLEN ;BC = length of module
3067 EDB8 01180 LDDR ;Move it
3069 EB 01190 EX DE,HL ;Move new HIGH$ to HL
306A 0600 01200 LD B,0 ;Select HIGH$
306C 01210 SVC @HIGH$ ;Set new HIGH$ value
306F 23 01220 INC HL ;HL=>New entry of module
;
;01230 ;*****
;01240 ; Set Type and Address in Filter's DCB
;01250 ;*****
3070 DDE1 01260 POP IX ;Get DCB addr off stack
3072 DD360047 01270 LD (IX+0),01000111B ;Set as FILTER capable
; of @GET, @PUT, @CTL functions
3076 DD7501 01290 LD (IX+1),L ;LSB of Filter address
3079 DD7402 01300 LD (IX+2),H ;MSB of Filter address
307C 21F230 01310 LD HL,DONMSG ;HL=> Success message
307F 01320 SVC @DSPLY
3082 210000 01330 LD HL,0 ;Show success
3085 C9 01340 RET ;Back to TRSDOS via SET
;
;01350 ;
;01360 ;*****
;01370 ; Messages
;01380 ;*****
3086 0A 01390 DB LF,'Function Key Filter',CR
309B 0A 01400 DB LF,'Filter Must be installed with SET comman
d',CR
30C6 0A 01410 DB LF,'High Memory not available for installati
on',CR
30F2 0A 01420 DB LF,'Installation Successfully Completed'
3116 0A 01430 DB LF,'Use FILTER command to link to keyboard d
river',CR
;
;01440 ;
;01450 ;
;01460 ;*****
;01470 ; Actual Filter Module
;01480 ;*****
3145 1811 01490 JR START ;Begin req'd header
3147 0000 01500 DW 0 ;Pre-installation HIGH$
3149 04 01510 DB 4 ;Name length
314A 46 01520 DB 'FKEY' ;Module Name
314E 0000 01530 MODDCB DW 0 ;Addr of module's DCB
3150 0000 01540 DW 0 ;For system use
3152 81 01550 DB 81H ;Data storage area
3153 82 01560 DB 82H ; with default settings
3154 83 01570 DB 83H ; of each key
3155 91 01580 DB 91H
3156 92 01590 DB 92H
3157 93 01600 DB 93H
;
;01610 ;*****
;01620 ; Start of filter process
;01630 ;*****
3158 3008 01640 JR C,FILTER ;Go if @GET request
;
;01650 ;*****
;01660 ; Here if @PUT or @CTL request
;01670 ;*****
315A DD2A4E31 01680 LD IX,(MODDCB) ;Get DCB ptr from header
315C 01690 EQU S-2
315E 01700 SVC @CHNIO ;Pass down the chain
3161 C9 01710 RET ;And send back unchanged
;
;01720 ;*****
;01730 ; Here on @GET requests
;01740 ;*****
3162 CD5A31 01750 FILTER CALL CHAIN ;Pass down the chain

```

Listing continued

device with an @PUT or @CTL request into the C register before calling the device chain. All programs must observe the rules for the use of the A, F, and C registers and the Zero and Carry flags.

As I said earlier, most of this month's listing (323 bytes) concerns initializing and installing the 69-byte filter. This installation procedure can be confusing to learn, but once you understand it, you can easily write your own filters.

After the necessary equates in lines 330-410, I've included a simple macro instruction that makes the rest of the program easier to write and understand. It simply invokes an SVC; for example, instead of writing LD A,@DSPLY followed by RST 28H, the macro lets you use the direct instruction SVC @DSPLY.

I designed the filter so that you can invoke it from TRSDOS with a command such as SET *FK TO FKEY/FLT followed by an optional list of parameters. From the user's point of view, that command associates the filter with the "pseudo-device" *FK, so that a later command of FILTER *KI USING *FK puts the filter into the keyboard input chain.

From a programmer's point of view, the Set command does two things. First, it loads the HL register pair with the address of the parameter list if there is one, so the program can later parse those parameters. Second, it opens a DCB for the new pseudo-device, *FK. A DCB is a 7-byte data structure in low memory that contains the necessary information for devices and pseudo-devices so you can route, link, and filter them. Without this structure, TRSDOS could not be device independent. When SET opens the DCB for *FK, it puts the address of the DCB in the DE register pair and then passes control to the installation program.

All drivers and filters must know the address of their own DCB, which you must store in the filter header at the label MODDCB. Since you'll need that address later, the first two instructions of the program (lines 560 and 570) push it onto the stack and load it into the filter's header. The program then points HL to the sign-on message and displays that message with the @DSPLY SVC.

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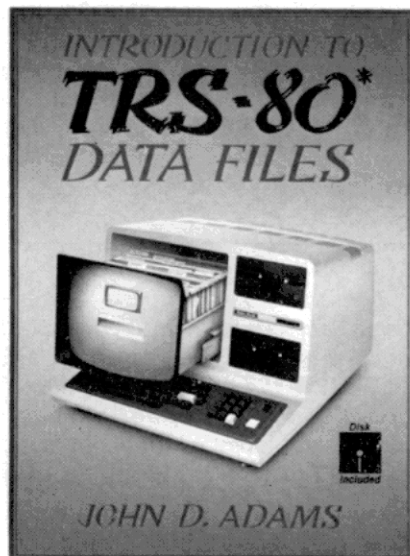
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THE NEXT STEP

Listing continued

```

3163          01760 RX02 EQU $-2
3165 C0       01770 RET NZ ;If no char or error
              01780 ;*****
              01790 ; Character was received from the chain.
              01800 ; Before returning to the calling routine
              01810 ; the Z flag must be restored, and the
              01820 ; appropriate character returned in A
              01830 ;*****

3166 FE81     01840 CP 81H ;Is it less than F1?
3168 380C     01850 JR C,LEAVE ; yes, then go
316A FE94     01860 CP 94H ;Is it greater than SF2?
316C 3008     01870 JR NC,LEAVE ; yes, then go
316E FE84     01880 CP 84H ;Is it F1, F2, or F3?
3170 3806     01890 JR C,CHANGE ; yes, then filter
3172 FE91     01900 CP 91H ;Is it SF1, SF2 or SF3?
3174 3002     01910 JR NC,CHANGE ; yes, then filter
3176 BF       01920 LEAVE CP A ;Set Z flag
3177 C9       01930 RET ;Back to caller
              01940 ;*****
              01950 ; A function key was pressed. Now, change its code
              01960 ; to 0 - 5 (F1 through SF3), then use that code
              01970 ; as an index to the data list in the module header
              01980 ;*****

3178 D681     01990 CHANGE SUB 81H ;0 if F1
317A FE84     02000 CP 4 ;Is it a shifted key?
317C 3802     02010 JR C,CHNG1 ;Go if not
317E D68D     02020 SUB 0DH ;3 if SF1
3180 6F       02030 CHNG1 LD L,A ;Value into L
3181 2600     02040 LD H,0 ;HL = offset value
3183 115231   02050 LD DE,F1 ;DE==> top of list
3184          02060 RX03 EQU $-2
3186 19       02070 ADD HL,DE ;Get offset
3187 7E       02080 LD A,(HL) ;Get new value
3188 18EC     02090 JR LEAVE ;Send it back
              02100 ;*****
              02110 ; Values for relocation
              02120 ;*****

3189          02130 FLTEND EQU $-1 ;End of filter
0045          02140 FLTLEN EQU $-FKEY ;Length of filter module
318A 5C31     02150 RELTAB DW RX01,RX02,RX03,0
              02160 ;
3000          02170 END BEGIN
00000 Total errors

```

End

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Next, the program must be sure you invoked it with the Set command. It checks this by examining the third bit of system flag C. The flags are a set of 26 bytes in low memory, each of which can contain up to eight individual pieces of information about the system's current state. The @FLAGS SVC points the IY register to flag A; other flags might be offsets from that address. The program checks to find if bit 3 of flag C is set. If it isn't, you've invoked the program directly from DOS, the value in DE at the beginning was in error, and the program terminates with an error message.

Finally, the program (lines 730-1200) goes through a standard series of routines to relocate the filter module to high memory and protect it there. Notice that it also changes all absolute addresses in the filter module by finding their addresses from a relocation table at the end of the program (which explains the reason for the RX01, RX02, and RX03 labels in the filter).

The last step of installing the filter is to set its address in its own DCB in low memory (see lines 1240-1320). First, the program stores a bit record at the beginning of the DCB showing that this is a filter capable of handling

@GET, @PUT, and @CTL requests. Finally, the program installs the filter's address (in high memory) in the DCB. Notice that the DCB has a pointer to the filter and the filter has a pointer to the DCB (in the MODDCB word in the header). Both pointers are necessary so TRSDOS can keep track of the Filter, Route, and Link operations.

Next month, I'll present and explain a companion program that lets you change the function key values after you've installed Three Keys, and also explain how you can use the function keys to produce strings such as EDIT and LIST while you are using Model 4 Basic. ■

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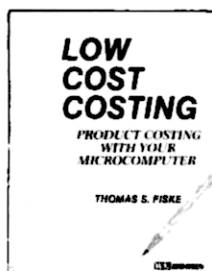
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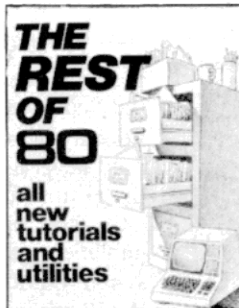
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Memory Management On the Model 2000

If you just bought a Model 2000 and started to run Basic programs on it, you might wonder what happened to all your memory. You're not alone in your bewilderment; the questions most frequently asked by Model 2000 owners concern the limits of the computer's memory.

Several factors affect the space available for your programs. First, the 80186 processor uses segment addresses and displacements to address the entire 1M byte of memory. For example, a 16-bit segment address points to the segment's beginning and the computer multiplies the segment address by 16 (shifted left by 4 bits) for each access to a location within the segment. The displacement is added to the result. The equation follows this format:

$$\begin{aligned}\text{Segment address} &= \text{E800H} * 16 \rightarrow \text{E800H} \\ \text{Displacement} &= \quad \quad \text{0FA0H} + \text{0FA0H}\end{aligned}$$

$$\text{Absolute address} = \quad \quad \quad \text{E8FA0H}$$

Each segment is limited to a 16-bit displacement value, so a segment's total available memory is 65,536 bytes (64K). The Basic interpreter works with only one segment for both data and program storage. Your program's maximum available memory is also 64K. Microsoft's Basic won't recognize any additional memory you install. The interpreter requires about 62K for some address space on a 256K machine.

128K of Memory?

What about the memory considerations of the 128K Model 2000? Before you can load Basic, you have to load MS-DOS. This consists of the two hidden files (IO.SYS and MSDOS.SYS) that you list when you run CHKDSK with the "/v" option. MS-DOS 02.00.02 requires about 50K RAM. The Basic interpreter requires about 49K, leaving the remainder of 29K available for the interpreter's work space. But, using simple arithmetic

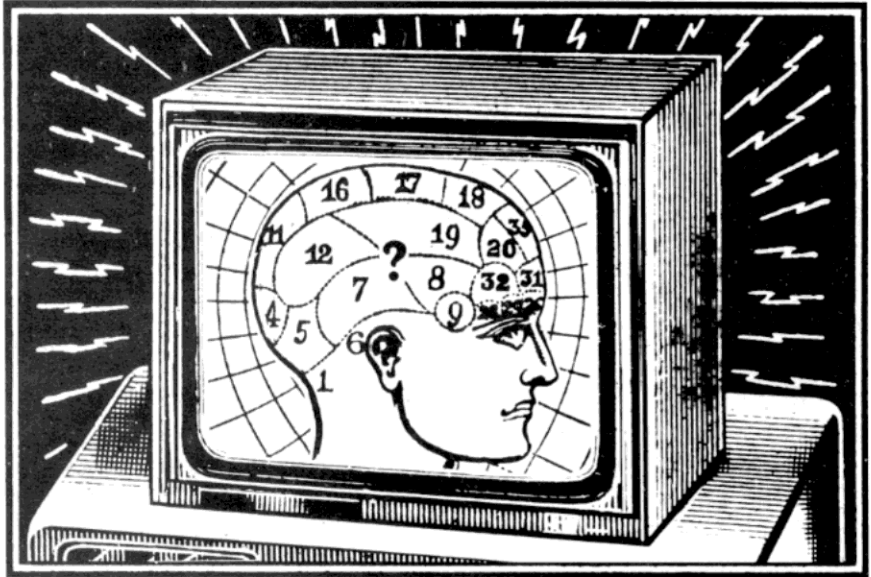


Illustration by John Craig

you'll notice that running any large programs (including some of the Model I/III software you transferred using the Convert command from last month) requires 256K of memory.

IBM Compatibility

The Purge utility that appeared in the September issue of *80 Micro* as a sidebar to 2000 Plus is great (p. 154). It only lacks a wildcard or multiple file purge function.

A short batch file improves the capabilities of Purge using MS-DOS system commands (see Fig. 1). KILL.BAT lets you specify up to seven file names for a wildcard purge. The For statement executes the specified command once for each element in the set. The statement KILL*.BAS FC*. * deletes all the .BAS files in the current directory, then it removes files beginning with FC.

A word of warning: HELP.BAT doesn't ask for any confirmation of the file names before deleting them. Press control-C if you notice an error.

If you want a copy of this routine (modified to run on a hard disk system), send me a self-addressed,

stamped disk mailer and disk and I'll write the source code and assembled version to the disk. The offer is open to anyone using an MS-DOS-compatible computer. Send the disk formatted for your computer if you don't own a Tandy 2000.

The Model 2000 can write to an IBM PC-formatted disk and an IBM PC can read it. You must write to a clean, formatted disk. Don't just erase all the files; reformat the disk using the Format command. You can write to either the single-sided format or the double-sided format.

MS-DOS's Nested Directory Structure

MS-DOS has a nested directory structure. This utility prevents you from transferring software without first considering the disk structure.

The nested directory feature lets the operating system store directories within directories. On a hard disk system, you can use this to your advantage.

Using subdirectories and small batch files you can execute your pro-

grams from the main directory. Figure 2 demonstrates how to use the batch file that's required to execute WordPerfect on the 2000. The batch file correctly selects the cleanup operations required, and returns to the main directory for another task.

I didn't clutter the main directory with all the files on the MS-DOS master disk. By keeping the main directory simple, I can use it within any subdirectory.

I solved the problem by copying all the MS-DOS files to another subdirectory called /DOS. Then I built an AUTOEXEC.BAT file that executes whenever you boot the computer from the hard disk that contains the following command: PATH.:C:\DOS. MS-DOS searches the current directory for the command and then searches the /DOS subdirectory on drive C (the hard disk). You can use the floppy drive as the default drive and still access any of the appropriate MS-DOS system routines on the hard disk without redefining the default drive.

Bugs in Model 2000 Software

Have you noticed that some software that's supposed to display bold intensity characters on the screen actually makes the characters dimmer than the normal text? This is caused by a BIOS code bug. If you have WordPerfect, you can patch the BIOS code using the VIDPATCH routine.

Ever wonder why MultiMate appeared on the shelves in Radio Shack stores sporting MS-DOS 02.00.02? The MultiMate upgrade corrects the defective BIOS code of the earlier version of MS-DOS. This defective BIOS code is also responsible for the poorly underlined letters on WordPerfect, Open Access, and other program packages. I discovered the problem with the BIOS code by trying to run

*Have you noticed
that some software
that's supposed to
display bold characters
on the screen
actually makes the
characters dimmer
than the normal text?*

Open Access after using MultiMate one night without resetting the computer.

Another bug in the earlier versions of MS-DOS (prior to 02.00.02) is explained by this Basic program:

```
10 SCREEN 3
20 CIRCLE (320,200),50,3
30 CIRCLE (320,200),100,3
40 PAINT (320,250),4,3
```

Run this, and it draws two concentric white circles filled with red and returns to the Basic OK prompt. The earlier versions of MS-DOS won't perform this correctly and require a control-C to interrupt the last statement.

A Permanent Fix

In the September column, I presented a sequence of operations that you could use through Debug to operate a non-Radio Shack printer with the Model 2000. In case you don't remember, you make the change by placing a 00 hexadecimal (hex) byte into absolute address 004DA hex. While this solution works, nobody likes to continually load Debug and make this change for each disk swap.

I came up with a better solution. Some explanation of the 2000's 80186 microprocessor addressing scheme helps clarify it. The 80186 can address up to 1 megabyte of memory, which

requires 20 bits to represent the maximum address (FFFF hex). To do this with a machine that uses only 16-bit addresses requires some complex operations.

Like several larger computers, the Model 2000 uses segment registers to point to the starting address of a block of code, data, and so on. The 2000 combines these 16-bit segment addresses with a displacement within the segment to form the effective address. The machine multiplies the segment address by 16 (shifting it left 4 bits), then adds it to the displacement.

For example, if the segment register contains 4F00 hex and the displacement is 0123 hex, the 2000 multiplies 4F00 hex by 10 hex (16) to get 4F000 hex. Then it adds the result to 0123 hex for an effective address of 4F123 hex.

Table 1 is a sequence of Debug commands that create a short machine-language program. The program sets a printer's line-feed byte correctly and automatically. The first instruction (MOV AX,40) sets the AX register to the value 0040 hex, which becomes the segment address.

The next instruction (MOV DS, AX) sets the data segment register (DS) to the segment address from the contents of AX. The third instruction (MOV [DA],AH) moves the upper byte of the AX register (which contains 00 hex from the first instruction) to the address pointed to by the DS segment register and the displacement (DA hex). The last instruction (INT 20) is a programmable interrupt returning control to MS-DOS.

The next Debug command sets the CX register to the byte count used in saving the program to a disk file. The N command sets the Debug file name, and the W command writes the number of bytes specified by the CX register to the file beginning at address

```
REM MS-DOS Multiple File Kill Procedure
REM written by John B. Harrell, III
REM
REM Files to be purged are:
REM      %1 %2 %3 %4 %5 %6 %7
REM
PAUSE ***** Press CTRL-C to abort *****
ECHO OFF
FOR %%F IN (%1 %2 %3 %4 %5 %6 %7) DO DEL %%F
ECHO ON
^Z
```

Figure 1. A batch file that executes the multiple file kill procedure.

```
CD \wordperf
PATH .;C:\dos
vidpatch 1
wp
CD \
```

Figure 2. This batch file starts WordPerfect.

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0100 hex in the current code segment.

I saved the program under the name of ADDLF.COM, and you can choose any name you wish in place of the one used in the N command. Now you can automatically install the patch by including ADDLF in the AUTO-EXEC.BAT file; your Model 2000 will run ADDLF.COM every time you reset it.

Command	Comments
Debug	Invoke MS-DOS's dynamic debugging environment to allow entering ADDLF.COM. Begin assembling symbolic machine instructions into location 0100 hex of the current code segment.
A100	Begin assembling symbolic machine instructions into location 0100 hex of the current code segment.
MOV AX,40	Load the AX register with the segment address 0040 hex. Note that the code segment address displayed (0E56 hex) might be different in your machine.
MOV DS,AX	Load the data segment address with the segment address in AX.
MOV [DA],AH	Move the upper byte of AX (containing 00 hex) to address 00DA hex of the data segment.
INT 20	Return to MS-DOS via system call.
Press the enter key	Exit machine-language assembler.
RCX	Display and modify register CX.
80	Set the CX register to 80 hex (128), the number of bytes to write to file.
NADDF.COM	Identify the file as ADDLF.COM.
W	Write the file to the disk.
Q	Quit and return to MS-DOS.

Table 1. Sequence of commands to create ADDLF.COM, a program that prevents removal of line feeds sent to the printer. You must terminate all entries in the command column by pressing the enter key.

New Software for the 2000

Despite the slow start in November, the Model 2000's picking up momentum in the software market (see Table 2). Radio Shack released two surprises: Lotus 1-2-3 and SuperCalc III. Both packages make use of the Model 2000's advanced hardware features.

Radio Shack's Express Order Software's growing, too. I wasn't sure that this concept would be popular, because of the difficulty in convincing people unfamiliar with software products to buy them without prior demonstration. I was wrong. Express Order Software has many new packages currently available on short delivery schedule from your local Radio Shack stores: Open Access, EasyWriter I, T/Maker, and others.

With this support and support of other software houses, success for this superior machine's assured. Soon, Ovation and MS-Windows should be available for the 2000, increasing the power and versatility of this machine.

Next Month, Word Processors

Next month I'll compare the word processing software available for the Tandy 2000. Find the one that's right for you. ■

Write to John B. Harrell III c/o this column, 80 Micro, 80 Pine St., Peterborough, NH 03458 or via CompuServe at 73016,1326.

Open Access
Software Products International
10240 Sorrento Valley Road
San Diego, CA 92121
Available through EOS
\$595

MS-DOS Version 02.00.02
Radio Shack Computer Centers
Catalog number 700-6201
Free upgrade

WordPerfect
Software International
288 W. Center St.
Orem, UT 84057
\$445

Lotus 1-2-3
Radio Shack Computer Centers
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Table 2. Model 2000 software product listing.

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Continued from p. 40

The DMP-420

At \$999, the DMP-420 is at the top end of the under-\$1,000 Radio Shack printers. It has excellent print quality plus other handy features, such as 132-column printing, super-/sub-scripting, Kana characters, and bold print.

Physical Description and Set-up

The DMP-420 is 6.3 inches high by 25.6 inches long by 13.6 inches deep and weighs about 35 pounds. Its control panel has on/off line, form feed, line feed, up 1/12 line feed, down 1/12 line feed, and reset buttons.

Probably the most confusing part of setting up the DMP-420 is removing it from the box, because it's so securely packed and protected. Radio Shack provides a sheet of instructions on how to unpack and repack the printer, and the front cardboard protector has removal instructions attached to it. Unfortunately, you have to partially remove the cardboard before you can read the instructions.

Once you get it unpacked, however, the remaining set-up is quick. The manual fully describes each aspect of the printer with illustrations and text. You attach a paper guide to the back, insert the ribbon cartridge, connect the printer cable, and plug it in.

A set of eight DIP switches on the back of the printer lets you choose between serial or parallel input, 600 or 1,200 bits-per-second serial input, word processing mode or data processing mode on power-up, ASCII or modified ASCII characters, European or Kana characters, line-feed options, and DMP-420 or LP-VI modes. Some of the DMP-420 commands are different from those of the LP-VI. If your software uses LP-VI commands, you can set the appropriate DIP switch on the DMP-420 so it can accept the LP-VI commands.

Fortunately, you wouldn't have to change the rotary switch or DIP switches very often. They're hard to reach and so small it's almost impossible to set them by hand; you really need a set of miniature tools.

Specifications

Bidirectional carriage motion prints approximately 140 characters per sec-

ond in standard pitch, up to 132 characters per line and 12, 6, or 8 lines per inch (computer selectable). It has an 8-bit parallel interface and an 8-bit, 600 or 1,200 bits-per-second serial interface.

You can start printing as soon as you insert the paper. The DMP-420 uses single-sheet or tractor-feed paper from 4 to 15 inches wide. You can remove the tractor-feed mechanism when you use single sheets, but that's optional.

The 420 provides three tests to verify proper functioning of the printer and two of them are performed without the computer. One tests carriage movement and the other repeatedly prints the 96 ASCII characters.

The third test sends data to the printer using a computer program. The Hex Print mode prints the data in hexadecimal, letting you verify exactly

The front cardboard protector includes removal instructions. Unfortunately, you have to remove the cardboard before you can read the instructions.

what information the printer receives, including control codes.

The actual printing noise is less than the DMP-110 and DMP-120, but there is quite a "klunky" sound with each line feed. Printing speed is significantly faster than the other two printers. According to our timing test, the DMP-420 is twice as fast as the DMP-120 and three times as fast as the DMP-110.

The three printing modes are data processing, word processing, and graphics. The data processing mode prints the fastest and is best for printing program listings and data. The printer puts a line-feed code into effect at the end of the line being printed and stays in effect until a new line feed code is received.

The word processing mode has better quality print and is better suited to letter-writing and text. A line-feed code is put into effect immediately and

is temporary. The line feed code is terminated by the next line feed or a new code.

The graphics mode is strictly for graphs or pictures. It prints only bit-matrix graphics and doesn't accept characters or standard line-feed codes.

You can choose from four print fonts and three character widths. Each font style has a unique dot-matrix pattern. The standard font uses a 9- by 8-dot matrix, the correspondence-quality font uses a 15- by 8-dot matrix, the proportional one uses a variable-dot by 8-dot matrix (depending on the letter), and block graphics uses a 6- by 6-dot matrix.

You can print the standard and block graphics fonts in all three character widths, normal (10 cpi), compressed (12 cpi), and condensed (6.7 cpi). The correspondence-quality font prints at normal width, and the proportional font prints at normal or condensed width (the cpi would vary because of the variable letter width).

You can print any of the fonts in elongated (twice the normal width) or bold (double strike) format, but you can't print them both elongated and bold.

You can set a rotary switch on the left front inside of the printer for the desired cpi when the printer is turned on. A software command code overrides the set cpi.

The standard or modified ASCII characters are available, as well as a set of 30 block graphics and 25 European or Kana symbol codes. Control codes provide underline, superscript and subscript, repeat and backspace capability. Backspace is accomplished by dot columns allowing designing and printing of special characters.

The Documentation

Most of the manual is clear and easy to understand but doesn't include an index. Although there are several small programs to demonstrate the use of the printer, we would prefer better explanation of the programs, especially in the graphics area. The graphics demonstrations are of poor quality and do little to show you how to design and use the excellent graphics capability of this printer.

This manual also contains sections on care and maintenance, potential problems, interface information, and a schematic diagram.

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Wrap-Up

In choosing a printer, you must carefully consider just what features are important for you. If you just want good quality print on regular size paper and have little or no need for super-/subscripting, then the DMP-420 may be too much printer for your needs. If however, you need a machine with these kinds of capabilities, and are willing to spend some time learning how to use it, then the DMP-420 is an excellent printer to consider. ■

Open Access: All Together Now

by John B. Harrell III

Open Access is an integrated package for the Model 2000 that neatly combines a data base, a spreadsheet, word processing, graphics, time management, communications, and utilities in a single, cohesive package. It's become one of my favorite software packages and I continually use it in preference to other programs.

Open Access's seven modules operate within the main "shell" of the system. You boot up Open Access, type in the date, and select one of the modules from the main menu. After you run that module, you save your data to disk and either run another module or exit the system.

Open Access



Software Products International
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San Diego, CA 92121
Available through Radio Shack
Express Order System

Tandy Model 2000
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Two disks or hard disk
Graphics and color (optional)
\$595

Easy to use? ★★★★★
Good docs? ★★★★★☆
Bug free? ★★★★★
Does the job? ★★★★★☆

Each of the modules operates within a window on the video screen and different areas of a module can activate overlay windows to display information on system options or module commands.

Global Features

Open Access provides several global features you can access from any of its modules, including a Help screen. When you invoke this screen, a window opens on the display describing the module or program mode in which you're working. You use any of the arrow keys or other movement commands to move through the help information.

In addition to the Help text window, pressing the F1 key a second time opens a window describing all the Open Access function keys and the Tandy 2000 keys assigned to those functions. Pressing the escape key (ESC) returns you to the last window opened.

If a file currently exists on your disk, the Search option displays a selected directory corresponding to the module you're in. If you're in the word processor, Open Access displays only files with .TXT and .DOC extensions. Once you highlight a file name with the cursor, you press the "do" (F12) or return key to call up a file name. You can't, however, call up a full directory or determine the file sizes from within the word processor.

A macro definition feature is available in all modules. This lets you program repetitive keystrokes and invoke them at any time. With this feature, anyone can accomplish even sophisticated tasks by pushing the macro button, selecting the Execute option, and typing in a name. In fact, you can assign the proper keystrokes to one of the user-defined keys and execute the

entire procedure with the press of a single key.

Information Management

Probably the most attractive feature of Open Access's data-base-management program is its simple command syntax. In ease of use, it even surpasses that of dBase II.

The commands are based on the key words From, Select, Where, and Order. You specify the data-base file from which you want to retrieve information with From, use Select to indicate specific fields, Where delimits your search criteria, and Order determines the sort sequence. You can search up to five independent data bases for specified information. Table 2 provides specifications for the information management module.

The record-selection process develops a virtual data base of all relevant records. You can manipulate this data base as you would any other, including inserting information into reports and letters or sending data to another module.

Data-base fields can have much more sophisticated attributes associated with them than the normal character, number, or logical fields. Additional field attributes include date and decimal (contains a real number).

More important, you can specify "Must Match" fields in the data base. The Must Match feature provides a safeguard against erroneously entering data. For instance, say you have two independent data-base files, one with customer information (name, address, balance, and so on), and another with order information (customer name, product number, purchase order number, etc.).

Now you want to record a customer's order in the Orders data base. By specifying the Must Match option,

Maximum number of data bases open at a time	5
Maximum number of records per file	32,000
Maximum number of fields per record	55
Maximum number of key fields per record	15
Maximum record size in bytes	1,024
Maximum number of characters in text field (key)	40
Maximum number of characters in text field (non-key)	59
Maximum number of significant digits	18
Maximum number of search conditions	64
Maximum number of sort fields	15

Table 2. Information Management specifications.

Open Access will cross-check the must-match fields of related data bases; that is, it checks fields common to related files. In this case, it checks the Customer data base to see if the name of the customer you're entering in the Orders file matches a name in the Customer file. If it doesn't, the Must Match window appears on the screen, highlighting the name closest to that you entered in the Orders data base. At this point, you can scroll through the customer data base in the Must Match window to see if you've simply made a spelling error or you can insert the missing name in the Customer data base.

You can sort fields in the data base by more than one criteria, too. Say you have a file listing all the executives of a major corporation and their salaries. You could sort the file not only by company vice presidents but by VPs that make over \$60,000 annually. Also, you can retrieve records with fields that fall within a range you specify. In the above example, you could retrieve files on company vice presidents that make \$30,000 to \$60,000.

The Information Management module uses screen and print masks to display information from the data base in a user-defined format. The screen masks appear for data entry or information display, while the print masks appear only on reports. Masks can use a number of selection criteria to guarantee that only the appropriate information is displayed. In addition to selection dependencies, you can use masks to join files together to select information from a virtual data base.

Information Management offers a powerful Browse option. This option displays information from a single file in the data base in two windows. The right window displays the field names of the file along with the data from the

current record. The left window displays the information from all of the records in the file sorted into ascending order. Cursor positioning controls let you select any record by highlighting the appropriate entry in the left window or display a list of other field contents by highlighting the appropriate field name in the right window.

Spreadsheet

The spreadsheet module included with Open Access offers all the functions of advanced spreadsheets plus a few extras: virtual memory for the worksheet and goal-seeking (see Table 3).

While most spreadsheets offer a standard number of rows and columns, very few of them let you use the entire sheet at once. MultiPlan, for example, provides over 16,000 cells but requires that your sheet be resident in memory at once. Consequently, you're limited by the amount of main memory available.

Open Access doesn't have this limitation because the worksheet is paged to and from the disk as required, letting you manipulate the entire 64,800-cell work area.

The goal-seeking feature allows for backward solution to a problem. Specify the calculation results or target values you want to achieve and the dependent variables you want manipulated, and Open Access calculates the necessary values.

While most spreadsheets offer a standard number of rows and columns, few of them let you use the entire sheet at once. Open Access doesn't have this limitation.

The spreadsheet module also lets you name cell values (similar to MultiPlan) with one significant exception: One named value can index another. This provides an exceptionally powerful means of manipulating data. For example, the area of the sheet named REVNUES is indexed by YRS. Therefore, you can make a reference to REVNUES(1984) and selectively call the data in the REVNUES cell for this year.

The spreadsheet module provides formatting capabilities for each cell to enhance your printed output. You have full control over the way Open Access displays numerical data, including several ways to display negative numbers (with the + / - symbol, parenthesis, or a credit/debit notation). You can also print each cell individually in boldface, underlined, or italics if your printer supports these features.

The only drawback to Open Access's spreadsheet is its slowness compared to dedicated spreadsheets. Also, the spreadsheet doesn't contain cursor positioning commands to allow rapid paging through the worksheet. You must depend on the repeating arrow keys to correctly position the cursor or remember the cell location and use the GOTO command.

Word Processor

Open Access contains complete text editing and word processing capabilities that offer most of the features of a dedicated software package. You can copy text (internally to a current file and externally from data files, including from other modules), find and replace text, and select printer features with an on-screen display of the boldface, underlining, and italics attributes.

While the word processor module is easy to use, it's also the source of some of Open Access's more noticeable limitations. You can't really describe

Maximum number of rows	3,000
Maximum number of columns	216
Maximum number of usable spreadsheet entries	648,000
Maximum number of screen windows	6
Maximum number of simultaneous models on screen	4
Maximum number of divisional levels for consolidation	7
Maximum number of branches for each division	30
Maximum number of consolidated models	over 25,000,000
Maximum number of named areas	116

Table 3. Spreadsheet specifications.

them as bugs, but you could consider them design deficiencies.

First of all, you're limited to a document width of 80 characters. This precludes processing many documents that exceed this carriage width. If you have a printer with a 15-inch carriage, for example, you could print a maximum of 255 characters on a line in the 17 characters-per-inch mode. But with Open Access, your video screen is limited to a maximum of 78 visible characters (the window border graphics use two characters).

Second, your document size can't exceed the buffer's capacity of 31,500 characters. This is approximately 10 pages of single-spaced text (54 lines of 60 characters per line). More important, you can't chain document files to produce documents longer than this length. Because of this limitation, Open Access isn't suitable for an environment where you would use it primarily for word processing.

The last drawback to the word processing module is the lack of a spelling checker. A spelling checker with a modest-sized dictionary is a must.

Graphics

Open Access's color graphics are something to behold, and they're easy to develop. Your first graphics presentation in the introductory section of the manual is a multicolored three-dimensional bar chart.

Three-dimensional plotting is the most complex of the graphics figures and it produces a beautiful bar chart. But you can also produce simple pie, line, or bar charts. And you can combine line and bar charts to display up to 30 "positions" (a single data value) on up to 30 "levels" (collections of groups of positions, e.g., financial information for an entire year may comprise one level) on an overlay graph.

You can combine line, bar, and pie charts to display the same 30 levels of data in separate windows, each having a different graph type with different colors.

In addition to creating graphs, you can select from a full range of colors, texture, and physical characteristics of the plotted data. Three-dimensional plots let you control the tilt and rotation of the graph and you can specify the content of the top, side, and labels (including the colors).

You can save any graph with the

You can route graphics printouts to a disk file and include them in a text file within the word processing module for printing with your correspondence.

Slide option. Open Access saves the graph and lets you recall it instantly at a future date. You can even sequentially combine these graphs to simulate a slide show, a handy feature for business presentations. The slide system allows a maximum of 32 slides. Each slide takes approximately 96K bytes (that's right—nearly a hundred thousand bytes) of disk space, so a single floppy disk can effectively handle only six slides.

You can print out this video presentation with a graphics printer. Open Access already supports many printers and it's easy to configure others. You can also route graphics printouts to a disk file and include them in a text file within the word processing module for printing with your correspondence.

I was able to print out my first graph on my Okidata Microline 92 within five minutes of starting the graphics introduction. This also pointed out a problem in the printer definition file for the Microline 92. I had to change the graphics-initialize code to allow 72 by 72 dots-per-inch printing. Circles do not print well with an aspect ratio different from 1:1.

Time Management

Time Management is a real time-saver for an office manager who has to track many tasks or appointments. A perfect example where the Time Management module would excel is a doctor's office. Time Management schedules appointments, prints reminder notes by day, prints out schedules, and even tells you of any conflicts. Time Management even manages multiple schedules, limited only by available disk space.

Another valuable part of this module is the rotary name and address file.

This filing system provides a quick method of tracking your contacts. The name/address file is maintained as a normal data base and you can access it with the information management module. The only difficulty here lies in the lack of a screen mask file, which is normally created automatically when you build a new data-base file. I overcame this problem by creating a dummy data-base file with the appropriate screen mask and then copying my name and address data base over the dummy data base.

Communications

The Open Access communications module proved effective in telecommunications.

Like the printer support, the communications module uses modem definition files to define your current modem/RS-232 port configuration. It supports auto-dialing, and the definition files already contain the configurations for the Hayes Smart Modem 300 and 1200. Each modem definition file contains its own directory of phone numbers. This is particularly nice if you access several commercial information services that use different baud rates and protocols.

The communications software lets you upload and download text and binary files. The module doesn't provide error-checking protocol, but it supports full XON/XOFF handshaking for a file transfer.

Open Access also supports communications with another computer directly in either the master or slave modes. You can use this module to control another computer or have another computer take direct control of yours.

Documentation

With any complex system, documentation is particularly important. My first impression of Open Access's software package was "Where am I going to put all this?"

In addition to the software disks, you receive the following manuals: a pocket reference guide, key description cards, softkey overlays, license agreement, the *Getting Started* manual, User Manual, Reference Manual, and the index.

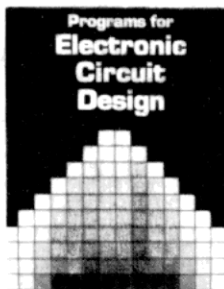
The *Getting Started* manual is exceptional. The first chapter provides a system overview, including instruc-

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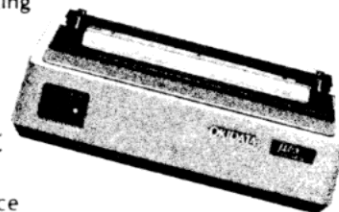
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tions on backing up the disks (and transferring them to the hard disk) and how to create a self-booting system disk.

The next chapter contains the system's demonstration. This is your first use of Open Access and it doesn't require any experience. The manual takes you through the demo step by step, providing computer-generated responses and answers.

The last part of the manual contains information for customization: selecting or adding an unconfigured printer, how to set up your own work disks, and advanced uses of the system utilities.

The user manual contains detailed tutorial information on every aspect of the system. Plan on getting several cold beers lined up in the refrigerator before starting these sessions. It took me two evenings of concerted effort to complete the tutorial.

The most pleasant part of the sessions was that everything worked—no mistakes or wrong turns. After the

The user manual contains information on every aspect of the system. I needed two evenings to complete the tutorial.

first chapter, I had a high degree of confidence in the tutorial information. Then, when I hit a snag, I only had to study the tutorial to discover where I went wrong.

The overall low mark in the documentation is the reference manual. My expectations were dashed when I opened it and found only general information about the system, instead of the detailed technical information I had expected. Consequently, it was hard to determine things such as maximum spreadsheet size and limitations of the word processor.

Other Complaints

Two BIOS problems contribute to difficulty with Open Access. There is a problem with spacing on non-Radio Shack line printers. This month's 2000 Plus column (p. 174) provides a patch that solves this problem.

The other BIOS problem concerns underlining on the video screen. In MS-DOS versions earlier than 02.00.02, underlining would destroy the bottom of the letters. Version 02.00.02 cures this.

I was surprised that Software Products International didn't include the option to print sideways down the page for graphics displays and wide spreadsheets. I can't dump the entire screen to my Microline 92 because of the 8½-inch effective print length and 72 dots-per-inch graphics capabilities. This yields 612 dots and falls short of the dot length of a screen line (640 dots).

Also missing is the ability to spool output to the printer. The computer is tied up and unavailable the entire time

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REVIEWS

you are printing. This would be a welcome addition.

One last complaint—Open Access doesn't let you execute any DOS command from within the system. You must exit the system and then return to perform any command whose function is not provided in Open Access.

In Conclusion

Is Open Access worth it? In order to approach its capabilities, you would need to purchase the following packages: dBase II (\$595), MultiPlan (\$249), WordStar (\$495), and Video-text Plus (\$49.95) for a total of \$1,389. You still wouldn't have graphics capability and the above software packages don't communicate with each other.

Even with the limitations mentioned throughout the review, Open Access provides more features than the packages mentioned for the same price as dBase II alone.

However, Open Access is definitely not for everyone. I certainly could not recommend it to anyone who planned to use it as the sole word processor

where documents of any magnitude are processed. It just isn't capable of handling the job. And if spreadsheet speed or large printed graphics are required, then the system does have its shortcomings. ■

Learning a New Language With Alcor's C Compiler

by John B. Harrell III

Alcor's C compiler is a superior product and a welcome addition to my software library. While its documentation could be better organized, it nevertheless gives you a well-rounded foundation in the C language.

Alcor C gives you an alternative to Pascal, Assembly language, and Basic, providing the structure and power of Pascal with the manipulative capabilities of Assembly language and the logic of Basic. Even though C is a medium-level programming language,

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The Software Package

The software comes on two disks (Model I users will find four single-density disks). The package includes a Blaise editor, the C compiler itself, a linkage editor, run-time libraries, an advanced development package, and full documentation. The disks also contain the source code for some of the more esoteric C functions, such as printing and scanning and the C library.

The Text Editor

The Blaise II editor that comes with the C compiler is excellent. You use it when you initially type in your program or edit a program you've previously typed in.

One of the editor's exceptional features is its ability to reconfigure itself through a terminal definition file created with the editor's SETEDIT utility. Not only does this file contain the key definitions for the normal editor commands, but you can redefine any key. For added power, you can develop macros and assign them to any key, and you can chain and nest one macro to another. The documentation's sample editor setup file demonstrates many SETEDIT features.

The editor's text buffer is limited to approximately 15,000 characters. Not a large program by some standards, but adequate when you consider that C demands modular development. Alcor C fully supports modular program compilation and separate file linking with the linkage editor.

The Compiler System

The Alcor C compiler reads source code and generates an object file in p-code. After this translation, you can execute the p-code file directly or through what Alcor calls its Advanced Development Package (ADP). With ADP, you can use an Optimize utility that further processes the p-code, removing all redundancies in the first-generation object code (this generates a file up to 30 percent smaller than the original object file). An optimized file generally runs faster than the original p-code version.

The optimization is generally peephole—it looks only at the code and the local effects, without attempting to analyze expressions and large blocks of code. This is an effective way to re-

The Blaise II editor that comes with the C compiler is excellent. One of its exceptional features is its ability to reconfigure itself through a terminal definition file created with the editor's SETEDIT utility.

duce most of the compiler-generated overhead in the p-code program.

Alternatively, you can use ADP's CODEGEN (code-generator) utility. It takes a p-code object file and writes a machine-language file from it. This produces a file that executes three to five times faster than the original object code. However, the translated output file isn't a true machine-executable file. Close examination reveals that CODEGEN controls its environment closely and toggles into the interpretive mode when it must execute a function too complex for in-line code generation. When finished, it toggles back to the host mode for execution.

The compiler, optimizer, and code generator all have a serious common deficiency. While each outputs code as an ASCII character file, each hexadecimal byte is represented by two ASCII characters! Simple arithmetic tells you that any sizeable program will use up the remainder of your disk space quickly—you'd need 20K bytes to store a 10K program.

The Alcor C compiler itself doesn't generate true machine-executable code as do most others. The most obvious result of this is slower execution. Personally, I feel this is far offset by the ability to link C language routines with Pascal, Basic (compiled with Alcor's MultiBASIC compiler), or Assembly language (assembled with Alcor's assembler). All these language translators generate identical object files and are compatible with one another.

You can compile and run many programs right away. If your routine doesn't require other routines, the RUNC run-time interpretive environment provides all the system routines

required. If your program uses other separately compiled functions, you have to use LINKLOAD to link all routines and the appropriate system functions together. LINKLOAD also saves the entire program and all linked functions with the run-time environment as an executable command file.

The compiler system is supported by seven libraries of functions: the system library contains the run-time system interface routines and low-level C functions; CLIB contains most of the standard C library functions; PRINTF and SCANF contain the object code for those respective functions; TRSLIB provides functions for those features common to the Model 4 or TRSDOS 6.X; Random supports random-access file input and output; Strings contains the dynamic string-handling routines.

Alcor has imposed a unique restriction on the C language. C specifies that any function returning a result other than an integer must be specifically declared by type in the external declarations of the calling routine. Alcor's implementation of this requirement is to invent a new data type, called Void, for those functions not returning any value. I found this limitation the single most limiting factor in transporting software from other C compilers.

Documentation

No software package of this magnitude is any good without adequate documentation to back it up. Alcor C has the documentation to support all facets of the system's operations.

The documentation is contained in a large (9- by 12-inch) three-ring binder in a shelf storage box. This sturdy exterior contains a wealth of documentation—over 500 pages of detailed description of the compiler system and text editor, complete for beginners to advanced users.

The manual is divided into six sections: one for beginners, one on the editor, a system section, a tutorial, a reference division, and an explanation of the Advanced Development Package. The beginner's section takes you through the steps necessary to create your working compiler system's disks. It also contains a simple introductory session with the compiler. The editor section is also the full reference section for the Blaise-II editor.



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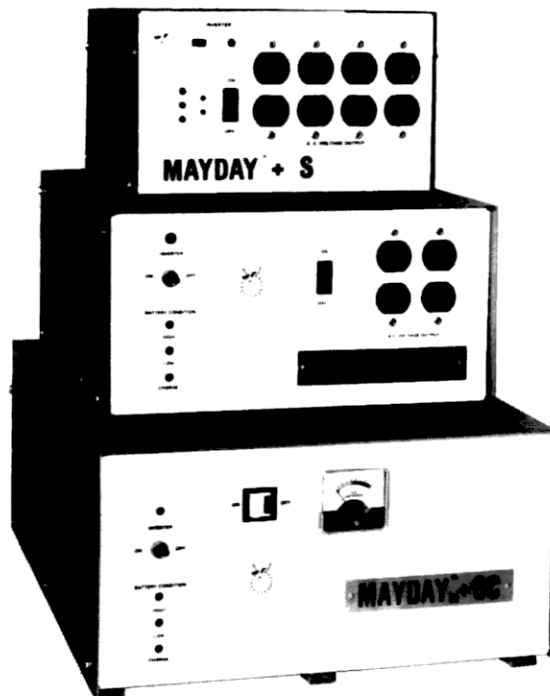
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REVIEWS

The System Implementation section provides specific information on Alcor's particular version of C. It concerns the host computer system that the compiler runs on: the memory use, how to compile and execute programs, and explanations of many of the system functions that are available.

The tutorial section is well-done. It's written for individuals without C experience but with some knowledge of a computer language. This is one of the only C compilers that doesn't require you to buy an outside reference for the language; the tutorial provides adequate instruction for most users.

The reference section provides a detailed guide to this implementation of C. It also documents the many other functions available with your C source program from the other libraries not addressed in the System section. All compiler preprocessor features and options are addressed in detail.

The last section documents the Advanced Development Package, consisting of the optimizer and code generator. This provides a detailed de-

scription of the object file's format and the Assembly language structure and format.

There are two problems with the documentation. First, there is a phenomenal amount to digest. Second, the organization is poor. For example, the documentation of the functions contained within the various libraries is spread out over two chapters. Further, there is no clear, well-highlighted distinction marking the division of functions in the libraries. Subsequently, I found it difficult to remember which library satisfied the various program external references while linking the compiled code. On several occasions, I loaded too many of the libraries while looking for the correct functions.

System Performance

Based on my experience with Mysis's LC compiler and on comparative tests I made between the two compilers, two things are immediately evident: Alcor C will never win any Olympic medals for speed nor will it

claim fame as "slim, trim, and racy."

But Alcor C does provide a distinct advantage over other C compilers when you consider the amount of time spent compiling the program. Because Alcor C compiles directly to p-code, it involves no overhead for lengthy assemblies of the intermediate Assembly language.

Conclusion

Alcor C is a substantial product that complements and substantiates Alcor's other software. In addition to providing a compiler that works well with their powerful Pascal and Basic compilers, Alcor's C compiler is a full, robust implementation of the language that will satisfy most needs completely.

Alcor is reasonable about using their compilers to produce software for resale. You can resell an executable program file without paying a royalty; you're only required to indicate that the program contains the Alcor C runtime support package.

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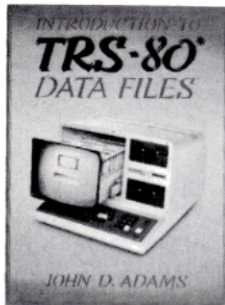
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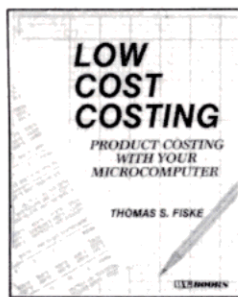
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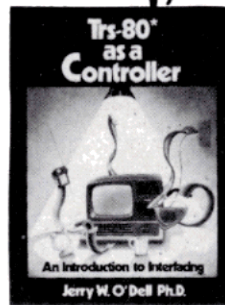
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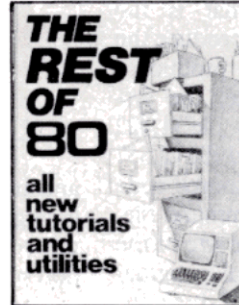
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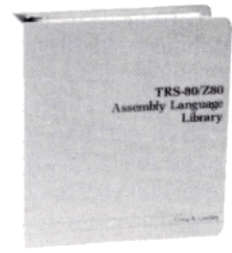
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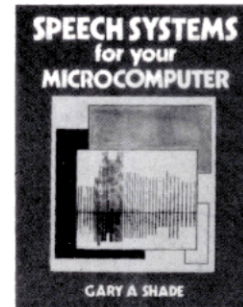
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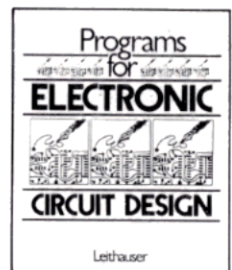
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If you design software that's time-sensitive or space-limited, Alcor C isn't for you. The residue from the compiler is important—that is the auxiliary files necessary to produce the end product. In order to produce a machine-code program file, the system must create an object file (1,422 bytes) and a code-generated file (2,557 bytes) in addition to the source code file and the 25,244-byte command file. There's no way to avoid the size of the latter file—even a minimal program (main() { }) requires 23,427 bytes to load the proper run-time support routines. ■

Basrum's Software Library

by Wynne Keller

Basrum is a linking loader and library manager utility for Model I/III Basic programmers. You create and name a library of subroutines with it, then call them into Basic programs as needed. I found Basrum convenient

Basrum is convenient and useful. It saves time for the programmer, disk space for the computer, and speeds up execution of a Basic program.

and useful: It saves time for the programmer, disk space and memory for the computer, and speeds up execution of a Basic program.

Basrum is written in machine language and occupies the top 1,600 bytes of RAM. The disk provides a different version of Basrum for each system memory size it supports (16K, 32K, 48K), and two extra versions for 48K machines that reserve 400 bytes and 2,048 bytes for upper memory hard-disk drivers or other machine-language software. And it's guaranteed to work with your DOS.

Getting Started

Basrum is shipped on a disk without

a DOS, so you have to move the Basrum files to the DOS of your choice using the Debug utility. You can't transfer files directly with some DOSes. In such cases, you have to use TRSDOS as an intermediate step. At first, I had some difficulty with this process. I entered the appropriate command and pressed the enter key, but the program ignored the command.

Finally, after much trial and error, I pressed the break key. The computer then executed the commands and moved the files as requested. I was able to transfer all the programs using this two-step sequence (hitting the enter and break keys). According to the manufacturer, no one else reported

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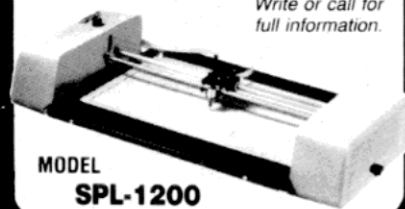
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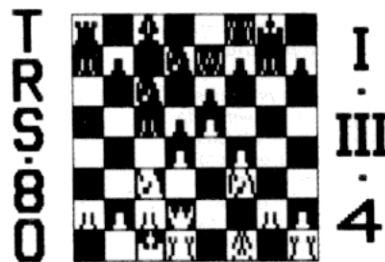
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this problem, so you may or may not encounter it.

Basrum manipulates computer memory extensively. After you load Basrum, it protects an area of low memory for the library function. Basrum loads Basic programs above this, in unprotected memory. It stores subroutines on one or more disk files. You can then load a file, or any part of it, into protected memory where it remains safe and accessible to any Basic program.

An alternate approach is to append the necessary subroutines to the Basic program in memory, in which case they're unprotected and will be lost when you load the next program. Normally, you would put frequently used subroutines, such as an INKEY routine, in the library area, while you would more logically append a subroutine that draws a car for a game to the appropriate Basic program.

Using Basrum

To create a Basrum routine, you simply put two asterisks at the begin-

ning of the code and two at the end. You can assign names to the subroutines for easy recall. For example, ****WAIT** might indicate a routine that accepts pressing the enter key to continue, and ****INKEY** might control program input. You can use Basic key words as subroutine names.

You can include remark statements with the subroutines without wasting memory if you put them before the asterisks. The comments aren't loaded when you call the subroutine, but they remind you what variables you used and what the subroutine actually does.

To simplify the job of converting a program to or from Basrum subroutines, the program features a Find routine. You can use this feature to invoke a global search and replace for any GOSUB commands you're changing to Basrum calls.

This program has two search modes: a logical search that ignores spaces, and a literal search that requires a perfect match, including spaces. The literal search is useful for finding a match within an ASCII string.

You can incorporate a special search function in Basrum as a command at the beginning of a Basic program. This function checks the program for any named subroutines that it needs, finds them in the file specified, and loads them.

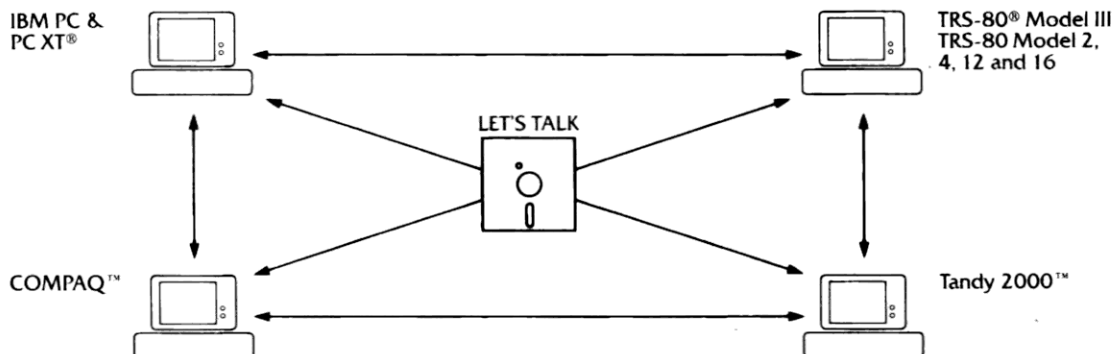
Basrum



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You can also use Basrum to chain or overlay programs. You can then execute programs in segments that are too large to fit in memory. Basrum passes variables and file buffers from the old program to the new one. It has a command that lets you specify the size of the various parts of the memory, including how much space to reserve for program overlays. It's possible to retain a resident program and overlay another program, or subroutines, in protected memory.

Some compilers will work with Basrum, but not all. According to the manual, only compilers that compile a portion of the code should function. You can't use compilers, like Microsoft's, that convert an entire program.

The Documentation

The manual is a bound 8½- by 11-inch paperback, attractively printed on heavy stock and easy to read. While the Basrum docs don't provide an index, the table of contents is very complete. Also, there is a glossary and a chapter listing error messages. Liberal use of bold print and indenting of text, as well as cross referencing, makes finding the desired information exceptionally easy. Help is also available on screen for any of the Basrum commands.

People who do enough programming to want to spend \$150 on Basrum are often involved with distribution of their work, even if only by sharing with local clubs. It is unfortunate that there is no provision for distribution rights to a Basrum runtime module so that its subroutines could be used in programs meant for sale or public domain. The manufacturer has recognized this need and states that they are currently working on a runtime module, which will be available to registered owners for a one-time fee of under \$30. ■

Ghost Busting

by Robert Mitchell
80 Micro staff

It is a dark and stormy night. You're traveling through a sleepy ghost town from the train depot, across town, to a haunted house. Suddenly,

ghosts appear and try to scare you away. Without blinking an eye, you reach for your ghost blaster. As a ghost exterminator extraordinaire, this is all in a day's work.

You are playing 13 Ghosts, a new Radio Shack game for the Model 4. Using the arrow keys, you move your ghost blaster (a blinking cursor) around the screen to shoot ghosts of varying sizes and point values as they emerge from the bottom of the screen.

As you shoot the ghosts, you receive points that scroll you further down the deserted main street—past a general store, saloon, hotel, cemetery, and so on until you reach the haunted house. Then you begin the return trip.

Each trip between the depot and the haunted house represents one level of play, but the difficulty level changes only every other trip.

Game Play

The game starts with four ghosts on the screen. All ghosts rematerialize at the screen bottom as soon as you shoot them. If some ghosts escape, other, more dangerous, ghosts (with higher point values) appear. Laughing ghosts have no point value, and call up more dangerous ghosts unless you shoot them.

The game continues until 13 ghosts escape your blaster. A counter at the screen bottom keeps track for you. You do have some help in ghost-busting. Spiders slide down the screen,

temporarily scaring away the ghosts. If you shoot a spider, your total ghost count decreases by one.

If you complete a trip to the depot or the haunted house with the ghost counter on 12, you get a ghost-free trip back through town. The point value for this trip is worth twice the score you'd get if you played the trip.

Shots take a moment before hitting a target, so you must shoot slightly ahead of the ghosts to score a hit. I thought cursor movement slow relative to the ghosts flitting about the screen. For the uninitiated this gives the game the appeal of a slow-motion nightmare.

One problem is the difficulty of distinguishing between the 12 types of ghosts. You're never really sure which ghosts provide the highest point values.

Play is slow at first, but don't get a swelled head after completing your first level of difficulty. The game becomes much harder the second time around.

I found it difficult to advance past the third of the 32 difficulty levels. As the game progressed, I got lost in a swirl of ghosts that left my blaster far behind. To pass through the different levels, you have to rely on your ability to predict where the ghosts will appear and fly.

Documentation and Sound

Documentation is good. 13 Ghosts comes with an eight-page booklet that includes illustrations, advanced strategy instructions, and technical information.

Game sound is low-key, a relief from the constant squawking of other games. It plays different tunes for the introduction, high scores, and bonus trips, as well as providing action sound effects.

Conclusion

Good sound and graphics, and the game's originality, make 13 Ghosts worth the price. Much detail is given to the background as you pass through the town, and new graphics are added with each difficulty level.

While 13 Ghosts isn't as fast as some other arcade games, it's just as challenging. It's an honest-to-goodness TRS-80 game—a rare thing these days—and a pretty good one at that. ■

13 Ghosts



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Good graphics? ★★★★★
Good docs? ★★★★★
Fast? ★★★★★
Challenging? ★★★★★

Learning to C

by Dan Keen and Dave Dischert

Although C may seem like an arcane high-level language, especially to those of us who regard Basic as the mother programming tongue, Robert J. Traister's *Programming in C for the Microcomputer User* does an excellent job of making the concepts of C clear to any programming novice. Traister has spent many painstaking hours presenting the basics of C in an easy-to-learn manner. If you have no idea of what a C compiler or linker is, or what the language itself is all about, you should pick up this book.

What Is C?

C is as powerful a language as Assembly language, yet you can develop machine-language programs more easily with it. C is a compact, efficient, fast, and transportable language that works on many machines, even if they use different microprocessors (assuming a compiler is available for your particular computer).

With the exception of Basic, no other language has yet to surface as the main force behind the development of system-level microcomputer software. C might just emerge as the victor.

Traister's *Programming in C*

Some programming books on C make comparisons to Cobol, Fortran, and Pascal, but most readers are more familiar with Basic. Traister, to his credit, makes frequent comparisons to Basic.

C is close to Basic in many respects. Each C routine has an equivalent Basic counterpart. Even though Traister explains each C program line by line, he points out the similarities to Basic. As a result, Basic programmers will feel more secure learning this new language since they can visualize C in terms familiar to them.

Every routine in the book is a complete, self-contained program ready to compile and run. The routines are short and excellent for teaching the fundamentals of this programming language.

The author uses an IBM PC and often makes reference to MS-DOS. This is especially beneficial to Tandy 2000 owners since their machines use MS-DOS and can take advantage of the extra features MS-DOS offers, such as

setting up batch files to handle all the compiling and linking processes.

In addition to the basics, Traister discusses the Supersoft C compiler, input control programs, handling character strings, and advanced programming in C. The appendix gives detailed use of the standard C library functions.

Of course, the main thrust of the book is to teach the fundamentals of C and get the reader's feet wet. We suggest that the reader have at least a little experience with Basic, since the author makes the assumption that you understand the idea of using letter variables to represent numerical values, as well as the symbols for math (+, -, *, /, <, >, =).

Drawback

The book's only shortcoming is that it doesn't go very deep. While it's a good book, it's designed for beginners prior to tackling a more complex reference. To do any complex programming, you'd have to buy a more advanced programming manual. ■

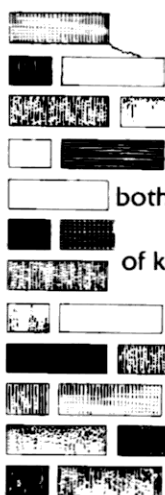
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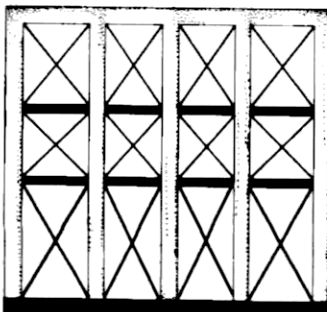


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The 418 features super- and subscripting, auto underlining, proportional spacing, shadow print, and bold print. It uses a cartridge ribbon and generates less than a 60 dB noise level during operation.

Its friction feeder uses 13-inch paper and prints up to four carbon copies. The printer comes with a parallel or RS-232 interface. A forms tractor and a sheet feeder are optional.

Reader Service ✓ 565

TK!Solver for the TRS-80

TK!Solver, an equation-solving mathematical analysis program from Software Arts, is available for the Model 4. The program accepts equations and known values, then solves for the unknown variables.

You can also enter properties and characteristics of variables, conversion definitions for units of measure, and other equation factors.

TK!Solver solves problems requiring repeated calculations. When the program cannot solve an equation using the direct method, it uses successive approximations to find the answer.



The Teal 418 printer features an 18 character-per-second print speed.

You can specify values and associate them with variables in a model, change conversion definitions, and print charts and graphs of program results.

TK!Solver contains 34 mathematical functions, including trigonometric, logarithm, and square root to reverse hyperbolic tangent and logarithm base-10 functions, and has an online help file and error checking.

The program requires 128K RAM, and is available for \$299.95 at Radio Shack stores. For more information contact Tandy Corporation/Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

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Esta-Mate runs on the Models III and 4 with 48K RAM and one disk drive and is available from Comp Plus Systems Inc., P.O. Box 72054, Roselle, IL 60172, 312-894-2444.

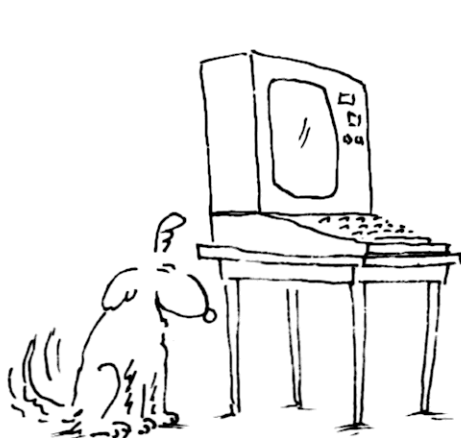
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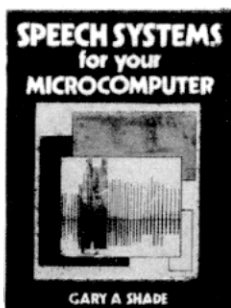
Speech Systems for Your Microcomputer has information on all the latest voice technology, for business, home, educational, or industrial use. You'll find out what speech systems are all about—getting your computer to produce synthesized speech and to recognize human speech. You'll learn how you can use voice I/O, in teaching programs, helping the handicapped use computers, talking home appliances, factory and test equipment, and more.

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Speech Systems for Your Microcomputer
Gary A. Shade
BK7406
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softcover, spiral bound
254 pp.

✓ 66

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You can display a plant diagram or switch to a control panel display while the plant operates. The object is to keep the plant at peak performance by properly resolving any problems that arise.

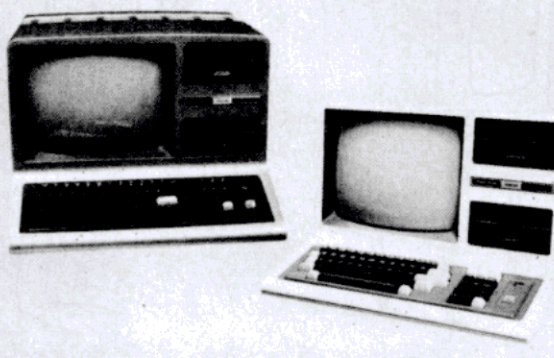
Meltdown is a commented Basic program published by Micro Mining and Assay Co., and is available from DiskCount Data (2701-C West 15th St., Plano, TX 75075, 214-680-8268) for \$19.95.

Reader Service ✓ 555

Computer Lessons

OK, so you've got a computer; now what do you do with it? *TRS-80 Models III and 4 Programming and Applications* (\$15.95) by Larry Joel Goldstein gives you the lowdown on the programming capabilities

TRS-80 Models III & 4 PROGRAMMING AND APPLICATIONS



TRS-80 Models III and 4 Programming and Applications introduces new users to computing.

and applications for the Models III and 4.

Written for the beginner, this 305-page paperback includes an introduction to TRSDOS, Model III and Disk Basic, and applications for business, graphics, games, simulations, and word processing.

Also included are exercises and questions to test understanding, and applications programs for everyday tasks.

Contact Robert J. Brady Co., Bowie, MD 20715, 301-262-6300 for more information.

Reader Service ✓ 554

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*Requires 256 kbytes minimum except for BASIC-68K.



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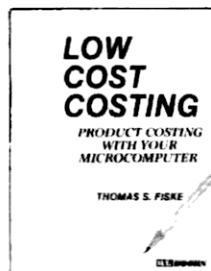
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NEW PRODUCTS

(704 N. Pennsylvania Ave., Lansing, MI 48906, 517-482-8270) handles payroll for up to 20 employees.

This Basic program produces payroll reports and maintains totals for each accounting period. You can add or subtract employees, change employee data, or process a payroll period.

Documentation includes instructions for modifying the program. Tinypay is available for the Models I, III, 4, and 2000 for \$20.

Reader Service ✓ 557

Modem Deluxe

The ProModem 1200 from Prometheus Products Inc. (45227 Fremont Blvd., Fremont, CA 94538, 415-490-2370) is a 300-/1,200-baud, auto-dial, auto-answer modem with a built-in



The ProModem 1200 has an optional 12-character display to keep you informed of modem operations.

clock, calendar, and many options.

It features programmable dialing, tone or pulse dialing, and a speaker with volume control for \$495. ProModem 1200 stores telephone numbers, access codes, and log-on messages in a directory, and uses up

to 12 characters to call up entries and initiate automatic dialing.

The modem buffer stores messages for automatic transmission at a specified time to any phone number in its directory. In auto-answer mode, ProModem 1200 automatically stores

incoming messages and the time it records them. The modem can run with the host computer turned off.

An optional 2K CMOS buffer card (\$99) uses a battery back-up to protect time, date, and other data in RAM. Up to 64K of additional memory is available in increments of 16K.

A 12-character display (\$99) gives operating status, diagnostics messages, phone numbers, and the time and date.

Reader Service ✓ 558

Drive Decontamination

Automation Facilities Corp. offers two disk-drive cleaning systems for your computer.

Floppicle is a wet/dry disk drive head cleaning system that safely and quickly

LOGICAL SYSTEMS CATALOG

1. **TBA** is a text pre-processor that translates structured BASIC "source" into interpreter executable programs. Supports long variable names and named references/procedures, along with conditional translation. **\$79.**
2. **BSORT/MOD324** is an advanced machine language sort for M4 BASIC. Multiple key/tag arrays, 1 or 2 dimension, string or numeric arrays. MOD324 does most of the restructuring to allow M3 BASIC programs to be run under M4 BASIC. **\$49.**
3. **DiskDISK** allows the partitioning of large volume drives into smaller logical volumes which "look" just like additional floppy drives. This should be considered a must for hard disk or other "large" drive users. **\$99.**
4. **FED II** is an all-purpose File/Disk editor for LDOS or TRSDOS 6. Bytes may be modified in either ASCII or HEX. Location may be done via search string, load address or record number. Shows disassembly of /CMD files. **\$49.**
5. **File Manager** will handle all those COPY, MOVE, PURGE or BACKUP jobs with ease. Faster and more versatile than BACKUP or PURGE. **FM** can also produce a "script" for later execution through JCL. **\$49.**

** Available for TRSDOS 6 only.

* Versions available for LDOS 5.1 and TRSDOS 6 (Specify when ordering).

6. **The LSI HELP System** is a complete series of packages to provide on-line help information to LDOS/TRSDOS 6 users. Packages are available for DOS/BASIC help, Technical help, and the development of additional "HELP" information files. Prices start at **\$29.**
7. **LS-HOST/TERM** is a complete Mod 4 communications system. Includes ADDS25 terminal emulator, XMODEM file transfer utility for error-free transfer, HOST program with password protection and much, much more. Ideal for use with XENIX. **\$199.**
8. **LED** is the LSI full-screen text Editor. Uses all LDOS special features (KSM, filters/drivers, ...). Excellent for editing KSM and JCL source files. T6 version includes "block write to disk" and "insert file at cursor". **\$49.**
9. **LS-QFB/Comp** consists of two utilities. QFB performs a "fast" mirror-image backup of a disk, formatting the destination disk in the process. Comp will compare any two disks or files, with differences to display or printer. **\$49.**
10. **The LS-Utility Disk** is a collection of the most popular LSI filters and utilities re-written for use under TRSDOS 6 on the Mod 4. Includes KSMPLUS, MAX-LATE, CALC, READ40 and much, much more. **\$49.**

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The Floppiclene System, for 3½-, 5¼-, and 8-inch disk drives, includes 20 cleaning disk inserts, disk jacket, Safebond absorbant wipes, and two Safeclens anti-static screen wipes for \$34.95.

Refill kits with 20 cleaning disks and Safeclene aerosol are \$14.95. For more information contact Intratec at 175 S. 3rd St., Suite 1020, Columbus, OH 43215, 614-461-4618

Reader Service ✓ 560



Compugreet computerized greeting cards come on fan-fold paper for continuous tractor-feed printing.

Season's Beepings

You want to send everyone a Christmas greeting, but you don't have the time to write and send out all those cards. With Compugreet's new LX series greeting cards, you can use your word processor and printer

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Eight designs are available for Christmas, birth-

day, and all-occasion uses. A box of 20 cards and envelopes is \$9.95. Boxes of 100 are \$45, and boxes of 300 are \$130.

For more information contact Compugreet at P.O. Box 3357, Reston, VA 22090.

Reader Service ✓ 559

Keene Programs

Keene Computing Services Co. (P.O. Box 13044, College Station, TX 77841, 409-846-4426) has three utilities for the Models I, III, and 4.

XIBM (\$35) copies files between MS/DOS or PC/DOS 1.0 disks and your TRSDOS, DOSPLUS, NEWDOS80, and LDOS system disks. This menu-driven utility includes an on-line help file.

Graphics Solutions

High-Resolution Software and Hardware

Radio Shack Model 4/4P/III hi-res board owners: GBASIC 3.0. This enhanced version of Graphics Basic provides an equivalent for all of the Radio Shack commands as well as adding a number of important new ones. The hi-res screen can be printed on any of 20 popular printers or saved or loaded to disk without leaving Basic. The software works with TRSDOS, LDOS, NEWDOS80, and DOSPLUS and uses 1400 bytes less memory. The disk comes with over 40 graphics related programs and a detailed manual which includes entry addresses for interfacing to assembly language. GBASIC 3.0 is required in order to run any of the following programs. \$49.95.

The following eight programs run on a Model 4/4P/III equipped with a Micro-Labs or Radio Shack graphics board:

DRAW - A sophisticated full screen graphics drawing and editing program. \$39.95.

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3D-PLOT - View three-dimensional data from any perspective or angle. \$39.95.

MATHPLOT - Plot equations of the form $Y=F(X)$ with auto scaling. \$39.95.

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BIOHYTHM & USA - Chart your biorhythm or learn the states and capitols. \$24.00

GRAFYX SOLUTION. Plug-in, clip-on board enhances any Model 4/III to provide 640 × 240 / 512 × 192 dot graphics. Comes with over 40 programs/files including Graphics Basic 3.0 which adds over 20 new commands. \$199.95.

80-GRAFIX. Plug-in, clip-on board upgrades any Model III/I to provide 128 user-definable characters. Comes with over 20 programs/files. \$99.95.

JOY-MOUSE. Allows a Radio Shack Color Computer joystick and mouse to be connected to any Model 4/4P/III. Hardware provides X, Y position values from 0 to 255. A built-in speaker produces sound from the cassette port. \$99.95.



G.I.N.A. Software program for the Model 4/4P/III/I which uses the standard block graphics screen to display a window to a larger 65536 × 65536 dot tablet. The arrow keys are used to draw two or three-dimensional figures. The display can be scaled, shifted, or rotated in any dimension. The final picture is printed in hi-res on Radio Shack, Epson, NEC 8023, or Prowriter printers. \$98.00.

Please specify your exact system configuration when ordering or requesting information. Payment may be by check, COD, or Visa/MC. Domestic shipping is free on pre-paid or COD orders. (Texas residents add 5% sales tax.)

✓ 464
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We use One-Year-Old Technology. Old enough to be reliable but not obsolete - that's «One-Year-Old Technology». WD-2793 Controller Chip, 8k CMOS RAM in Flat-Pack versions. State-of-the-Art? Certainly! And reliable.

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We burn in and test everything, before it is shipped - under realistic operating conditions in TRS-80 Computers.

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✓125



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NEW PRODUCTS



The Falcon disk file protects disks in eight clear plastic compartments.

The program has functions for calling disk directories and for listing and copying files. It requires one disk drive.

The X68K machine-language absolute cross assembler for the MC68000 microprocessor (\$59) lets you develop MC68000 programs and download the object code to any MC-68000 system with an RS-232 port.

The program supports the Motorola primary instruction set and addressing modes, has unlimited source and symbol file size, and has a separate system symbol file.

X68K includes a file numbering utility, system symbol file manager, and a test source file that lists the instruction set. Program updates are available for \$5.

The utility runs under TRSDOS, NEWDOS80, MULTIDOS, DOSPLUS, LDOS, and LS-DOS/TRSDOS 6.0.

XU (\$45) is a package of 14 utilities that run on the

Models I, III, 4, and 4P. Utilities include a line editor/printer, read/write head cleaner, a string search program, a file linker, and a program to display file mask expansion.

Keene Computing periodically adds utilities to XU and sends updates to XU owners. XU runs on the Models I, III, 4, and 4P under LDOS, NEWDOS80, MULTIDOS, DOSPLUS, and TRSDOS 1.3 and 6.1.

XIBM, X68K, and XU run on the Model I under LDOS only.

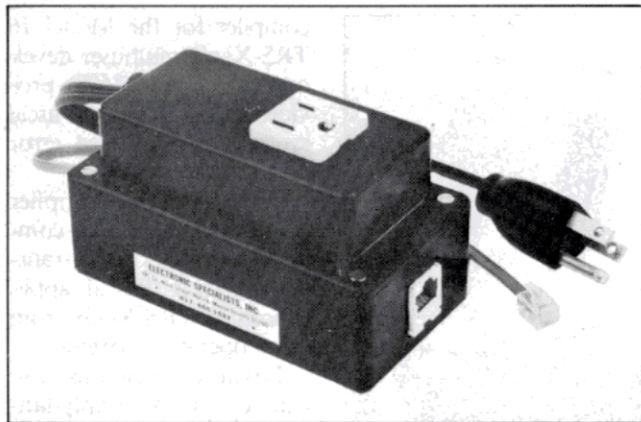
Reader Service ✓ 556

Disks Exposed

The Falcon disk file's unique design lets you store your disks and see them without taking them out of the file. It organizes and protects 5¼-inch disks in eight separate compartments. Disks are enclosed in clear plastic, flip-back compartments for easy access.

The file stores disks upright and supports them to

NEW PRODUCTS



Power surges can hit your system through phone lines as well as power supplies. The Kleen Line security system protects you from both.

prevent warping and bending. It also keeps out dirt and dust contaminants. File capacity is 56 disks, seven disks per compartment.

The disk file is \$24.95 from Falcon Safety Products Inc., Dept. V, 1065 Bristol Road, Mountain-side, NJ 07092, 201-233-5000.

Reader Service ✓ 563

Hard-Driving Software

Two optimized hard disk drivers from Powersoft (11500 Stemmons Freeway, Suite 125, Dallas, TX 75229, 214-484-2976) offer Model I/III/4/4P owners with hard drives greater flexibility than standard drivers.

The Series R/S driver (\$99) for Radio Shack hard drives runs with the Model I/III under LDOS or with the Model 4/4P under TRSDOS 6.0. These drivers offer full partitioning flexibility by the head offset or cylinder offset method, and can address the maximum logical drive size of 13 megabytes in one partition.

The Install feature formats, verifies, and sets up the drive to your specifications, then produces a con-

figuration that the driver SYSGENs permanently.

The R/S driver boots off the hard drive on the Model 4P—you don't need a floppy disk.

The WD Series I driver (\$99) for non-Radio Shack drives supports 5-20 megabyte drives on the Models I, III, and 4. WD Series I works on drives from BT Enterprises, Percom, MTI, Compukit, Micro-Design, Level 4, Prometheus, and any drive using a Western Digital controller board.

Both drivers let you share your hard drive between LDOS 5.1 and TRSDOS 6.0.

Reader Service ✓ 562

The Phoneman Always Rings Twice

When lightning strikes you need to protect more than your computer's power supply; your modem's phone line connections can wreak havoc on your system.

The Kleen Line security system uses metal oxide varistor and gas discharge tube technology to suppress telephone and power line surges caused by lightning, spherics, or phone office switching equipment.

Models are available for 4-pin modular connectors

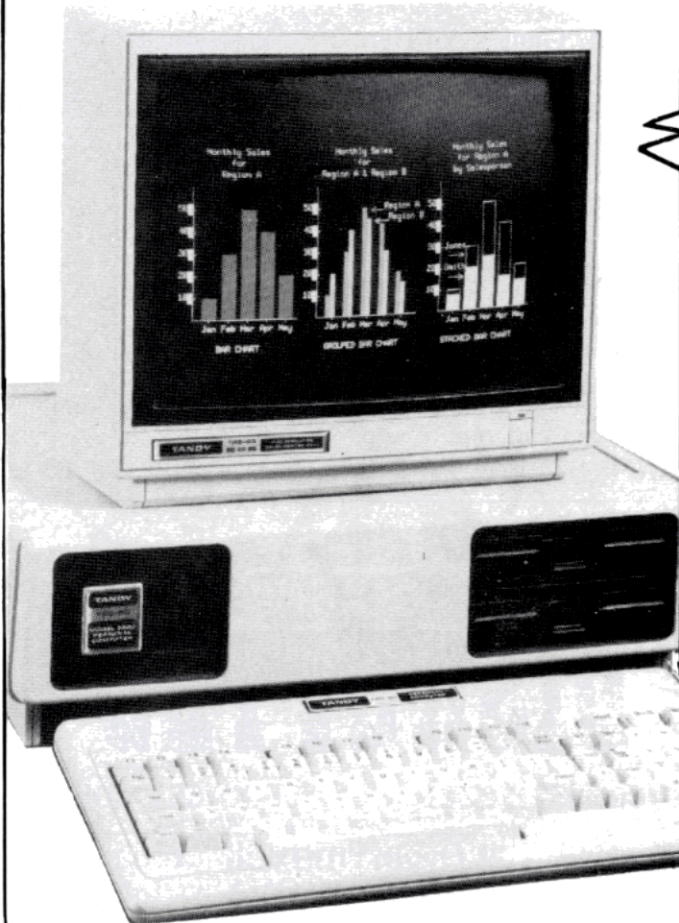
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NEW PRODUCTS

(\$65.95) and 8-pin connectors (\$130.95). Both models include a 6,500-amp suppressor to protect your modem's power line.

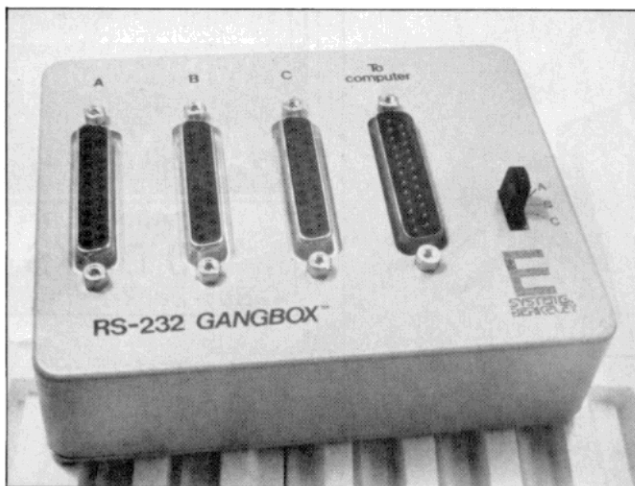
For more information contact Electronic Specialists Inc., 171 S. Main St., Natick, MA 01760, 617-655-1532.

Reader Service ✓ 569

The Gang's All Here

Gangbox (\$49.95) expands your RS-232 serial port to accept three peripherals, and lets you switch back and forth between your modem, printer, plotter, or other devices.

You provide standard male-to-female extension cable: Gangbox does the rest. Plug your peripherals into the A, B, and C connectors and run your peripherals by turning the



Gangbox expands your RS-232 port to accept three peripherals.

switch to the proper setting.

Gangbox comes in a sealed, die cast aluminum case and includes a one year warranty on parts and labor. For more information contact E-Systems, Berkeley, 2308 Fourth St.,

Berkeley, CA 94710, 415-486-0686.

Reader Service ✓ 571

Model 16 Pascal Compiler

Oregon Software's Pascal-2 high-performance

compiler for the Model 16 TRS-Xenix multiuser development system (\$699) provides more readable Pascal syntax and improved error diagnostics.

The Pascal-2 compiler produces faster, more compact code than C, and translates existing Pascal applications to TRS-Xenix from other operating systems.

Pascal-2 programs can call C or Assembly-language subroutines to run existing TRS-Xenix software, and you can move Pascal-2 programs to other operating systems that use standard Pascal compilers.

The compiler features nine types of code optimizations and type-compatibility checks during compilation. Run-time checking detects array index, input/output, arithmetic, and other errors.

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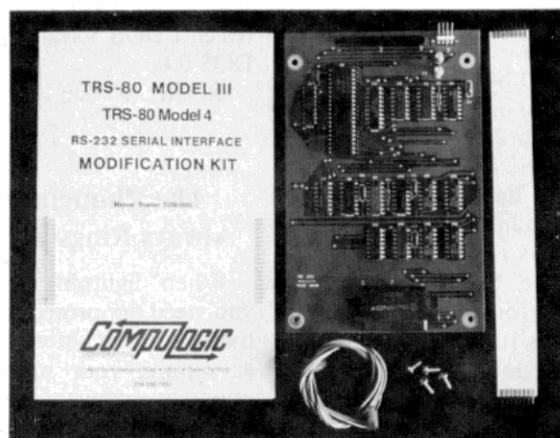
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NEW PRODUCTS

Pascal-2 includes a user's manual and introductory textbook for the Pascal programmer, and is available at Radio Shack stores. Contact Oregon Software Inc. (2340 S. W. Canyon Road, Portland, OR 97201) for more information.

Reader Service ✓ 566

Watt's Up

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Inc., 950 S. Cherry St., Suite 920, Denver, CO 80222, 303-759-0368 for further information.

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Stories of Steele And Stone

Sam Steele and the Stone Girl (\$24.95) is a private eye

adventure game for the Models I and III that combines the suspense of private eye adventure novels with the excitement of an adventure game.

You are Sam Steele, a streetwise, but down-on-your-luck private eye out to solve the case of your life. As you wander through the game's 130 rooms, you encounter an assortment of characters.

The game starts with a call from one of the city's most prominent citizens. After that it's a race against time as you use your wits and intuition to check out leads and solve the case.

For more information contact Allegro Software, P.O. Box 6593, Station J, Ottawa, Ontario, Canada K2A 3Y7.

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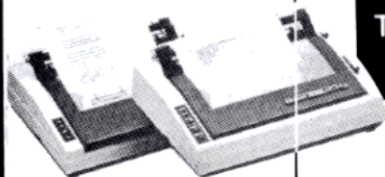


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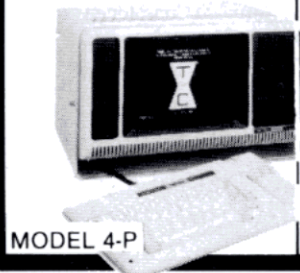


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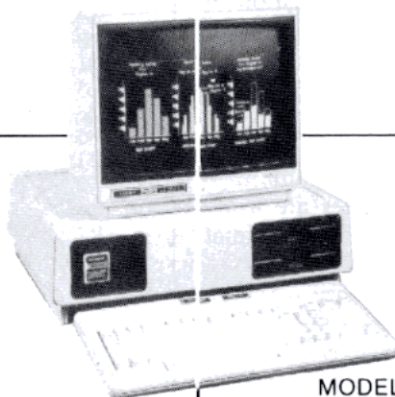
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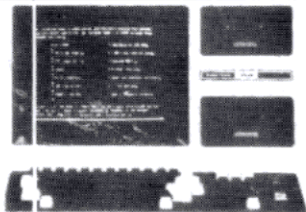
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MODEL 4-P



MODEL 2000



MODEL 4

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Flash-Com has search capabilities for on-line data bases such as The Source, Delphi, CompuServe, Instant Yellow Pages, and NewsNet, and works with dumb or smart modems.

The package is \$299 from Omni Computer Systems Inc., P.O. Box 162, Chestnut Hill, MA 02167, 617-825-6700.

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Communications on Your Terms

Century Software's Term communications software for Model 16 Xenix systems combines sophisticated communications capabilities with ease of use.

Term lets nontechnical Xenix users communicate through the serial port with remote systems, modems, and lap-sized and portable computers outside the Xenix environment.

You can transfer ASCII and binary data between Xenix and other systems via direct cable or modem, and you can select carriage returns or line feeds for text file compatibility between systems.

Other features include a dumb terminal emulation mode for remote systems, automatic error checking and retransmission, and a data capture feature for saving transcripts of sessions to disk.

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Reader Service ✓ 570

Video Computer Tutorials

If you've got a VCR and want to learn more about your Model 4, Embassy Home Entertainment (1901 Avenue of the Stars, Los Angeles, CA 90067, 213-553-3600) offers Compu-Tutor, a series of 1½-hour videocassette tutorials that cover four applications programs.

Modules teach the fastest, most convenient, and least intimidating way to use your computer and applications software.

"Using Your Machine" introduces you to computer jargon, hooking up equipment, how to use the keyboard and special function keys, operating system commands, using printers, and using software.

"Using VisiCalc" shows the basic properties and applications of the VisiCalc electronic spreadsheet. The video shows VisiCalc screen displays.

"Using WordStar" shows the use and application of Micropro International's word processing program for CP/M Plus. "Using dBase II" shows how to use Ashton-Tate's relational data base program.

Videocassettes are available in VHS or Beta format and are \$69.95 each.

Reader Service ✓ 568

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

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Established clients prepare communications and transmit their messages to TelePsych, then call back after seven days for Dr. Miller's reply.

Dr. Miller charges by the word: 7/10 of a cent per word sent, and 2 cents per word for Dr. Miller's replies. Clients must send a \$25 deposit against services.

On-line pamphlets containing brief advice on computer addiction, how to choose a therapist, quitting smoking, anorexia, and other subjects are available free to callers.

TelePsych is less expensive than face-to-face counseling, and is especially suited to persons with relatively minor problems.

Access TelePsych at 209-473-8296. Parameters are 8-bit word, 1 stop bit, 300 baud. If you have trouble accessing the system, call 209-473-4211, or write Dr. Miller at 2155 W. March Lane, #2B, Stockton, CA 95207.

Reader Service ✓ 564

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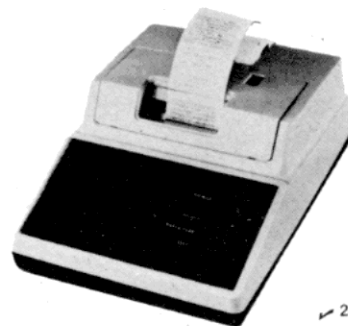
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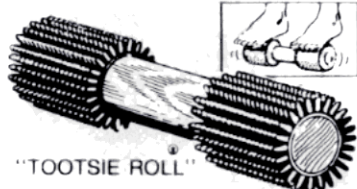
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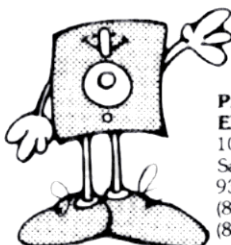
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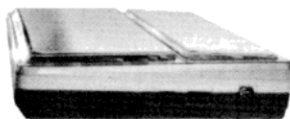
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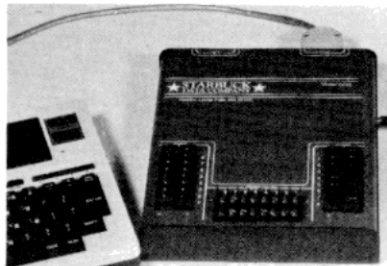
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How Tandy Designs and Buys Its Micros

Starting this month, 80 Micro will feature "Ask Tandy," a column in which the Tandy people in Ft. Worth answer your questions about their products and services. Just to get the ball rolling, we gave them a list of questions that we've heard from TRS-80 users lately. If you have a question, send it to Ask Tandy, 80 Micro, 80 Pine St., Peterborough, NH 03458.

Q: How does Tandy/Radio Shack decide what features should go into a new computer?

A: Several factors go into defining a new machine: available (possibly new) technology, customer requests, technical support requirements, an established need or market, and what the competition is likely to introduce.

Q: We hear a lot about Radio Shack's buyers. Who are they, and what do they do?

A: Buyers develop a product line, request and approve advertising for their line, and make sure products are available in the stores in the right quantities. Each buyer is responsible for sales projections for his/her product.

The computer buyers are a shy group, and asked that we not publish their names. I can tell you that there are eight of them (and more people in the Software Product Planning Group). The current buying areas are for the Models I, III, 4, and 4P, education products, peripherals, computer accessories, the Models II, 12, and 16, the Color Computer, the Model 100 and Pocket Computers, and the Tandy 2000.

Q: Why doesn't Tandy release figures showing the number of machines it has sold?

A: We think published sales figures are confusing. Tandy/Radio Shack is both the manufacturer and the retailer, so we'd have to decide whether to publish the number of units shipped

from the factory or the number sold to final users. Figures differ depending on whether you include floor demonstration equipment in the number of machines sold. Because we have no single definition of a sale (in dollars or units), we don't consider publishing sales figures to be useful.

Q: Why doesn't Tandy bundle software with its computers, as Kaypro does?

A: We feel that each user's software needs are unique. Why should we make you pay for a bundled word processor if you don't want a word processor? Or make you buy a bundled data base management package that doesn't do what you need done? Our philosophy is to let you choose the software that's right for your application.

Q: When the computer industry seems to be moving toward generic DOSes, like MS-DOS and Unix, is there room for a proprietary DOS like TRSDOS?

A: Generic DOSes certainly fill a need in the marketplace, and to serve that need we sell MS-DOS, CP/M, RS-Xenix (an authorized version of Unix), and OS-9, and we might sell other operating systems as we see a market need.

We also feel that there's room for our own DOSes. For the first-time disk user, Disk Basic on the Color Computer is nearly invisible and quite easy to use. If the user needs a more complex DOS we offer OS-9.

Traditionally Radio Shack's DOSes have been designed to help and protect the end user, and we think there will always be a need for that type of operating system. Even within the Xenix environment we established a user-friendly shell (tsh) so the user can get

work done without having to learn how to operate one of the more complex shells available under Xenix.

Q: Is it true that Tandy has its own subway system?

A: Yes, we do have a subway that goes from Tandy Center to our employee parking area.

Q: Why did Tandy stop publishing the TRS-80 Microcomputer News?

A: We had to make a decision: expand the size of the Microcomputer News to 100-plus pages so that we could properly cover the expanding Radio Shack computer product line, or else find some other way to provide that coverage and support. When the News was first published it was, essentially, the only vehicle for providing written support to our customers. As the product line grew, coverage in other publications (including 80 Micro) increased. Tandy/Radio Shack feels that we can provide better, more complete support by using the existing magazines than we could by competing with them for subscription dollars.

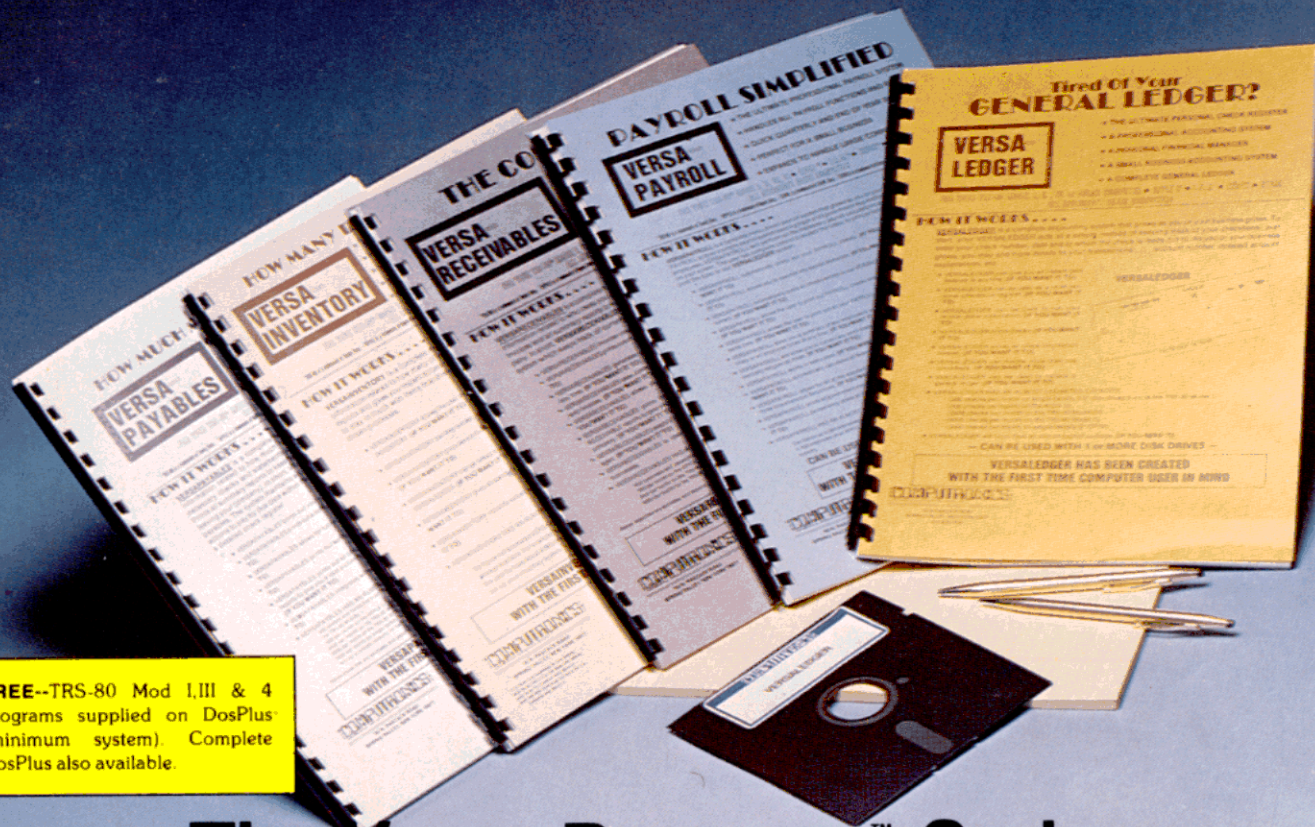
Q: What sort of computer training do Computer Center salespeople get?

A: Each salesperson receives approximately 100 hours of formal, classroom, hands-on training in areas of company history and philosophy, sales techniques, and specific product training. Employees have three months to complete this training and advancement is related to the amount of training they've successfully completed. ■

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